THE UNIVERSITY OF ALBERTA

FARMER RESPONSE TO DEPREDATION BY WILDLIFE ON AGRICULTURE IN THE ATHABASCA AREA

by

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A THESIS

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "Farmer Response to Depredation by Wildlife on Agriculture in the Athabasca Area" submitted by Michael Crispin Jansson in partial fulfilment of the requirements for the degree of Master of Science.

ABSTRACT

This thesis describes the opinions and attitudes of two groups of farmers towards wildlife in the vicinity of Athabasca, Alberta. In this area there have been chronic problems of wildlife depredation on agriculture. The two groups of farmers considered are those who report wildlife damage to government agencies and provincial insurance schemes, and those who do not report such damage. Damage was caused by several species.

Two samples, one of reporters and the other of non-reporters, each consisting of fifty farmers, were interviewed using a questionnaire. All farmers in both samples were asked about their activities connected with wildlife. These activities included subscription to insurance covering risks of wildlife depredation, sport and pest hunting preferences, the allowing of hunting by the public on farms, membership in the local Fish and Game Association, wildlife control practices on the farm, most and least troublesome animals, preferences for changes in animal populations, and solutions to the depredation problem. Those farmers who had suffered damage were asked to give details of the type of damage, causal animal, costs, perceived reason for occurrence, and agency to which reported, if any.

The costs of damage to those that reported were generally higher than those of the non-reporters. It appears that should costs to the non-reporters increase they would become reporters. The causal species of depredation had no bearing on the farmers' decision to report. Membership in the Fish and Game Association was held by more reporters than non-reporters. Several possible explanations are offered. Control measures

were taken by large majorities in both groups. These measures were usually aggressive or defensive and tended to be unimaginative. Neither group showed strong preferences for any proposed solutions to wildlife problems. Desires for animal population changes had two tendencies. Those who suffered depredation wanted the causal species reduced or eliminated and most farmers in both groups wanted increases or introductions of game species.

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INTRODUCTION

The study of perception in the geographical context is concerned with identifying attitudes and responses of humans, individually or collectively, towards sporadic events or persistent situations. The events and situations are either contrived by man or a result of natural phenomena. They may vary in terms of areal extent, duration, frequency, and potential beneficial or detrimental results for man.

Research dealing with the perception of occurrences that are threatening to man's life and livelihood have proceded along two distinct lines (Burton, Kates, White, 1968, p.4). The first line of approach has been the study of catastrophic events in an attempt to predict behavioral patterns in the event of nuclear disaster. This work has been carried out mainly by behavioral scientists. Their studies have focused attention on the acute emergency phases during the disaster, and the high stress phase immediately following disaster. An example of this approach is the <u>Disaster Research Group Studies</u> series sponsored by the National Academy of Science and National Research Council (both U.S.) which have included such titles as; <u>The Social and Psychological Consequences of a Natural Disaster: A Longitudinal Study of Hurricane Audrey</u> (Bates et al., 1963). The Disaster Research Center of Ohio State University has published work of a similar nature in its <u>Disaster Research Notes</u>. Wolfenstein (1957) and Sorokin (1942) have both written books discussing sociological and psychological ramifications of natural disasters (Burton, Kates, White, 1968, p.4).

The second line of approach has been concerned with persistent settlement in geophysically hazardous areas. Some of the Natural Hazard Research Working Papers edited by Burton, Kates and White (1968) have followed this approach. These papers have discussed the components of settlement in hazard prone areas. Some of these components are: objective measurement of the hazard, risk evaluation, adjustment mechanisms and decision making by occupants of hazard prone areas, and responses to stress resulting from occupance. Psychological testing, probabilistic model construction, as well as direct interviewing have been used in these studies. One other important aspect of this work has been the cataloguing of areas throughout the world where geophysical hazards exist.

This study represents a departure from the second line of approach in that it deals with a recurring biological hazard; wildlife depredation upon agricultural property. Wildlife depredations in some areas constitute a serious hazard to farming. The farmer's ability to subsist, let alone prosper, may be dangerously threatened if wildlife continually causes property damage. In areas of damage susceptibility the farmer's attitudes influence his decisions and ultimately his adjustment to the hazard. Utilizing some of the techniques used in geophysical hazard study this thesis is an attempt to define the wildlife hazard, to discuss spatial variances, and responses to the hazard.

A number of regions in Alberta were considered for use in this study; the Athabasca Officer District (hereinafter referred to as the A.O.D.) of the Alberta Fish and Wildlife division was finally chosen. This area is particularly suitable for a study of this nature because

of the faunal variety, expanding agriculture, and the availability of complaint and damage records.

The northern portion[1] of the area contains what may be termed 'fringe' agriculture. In this area land clearing, drainage, and breaking is still in progress, constantly changing wildlife habitats. Many of North America's big game species, as well as numerous small mammals and birds, are to be found on the uncleared margins of settlement. Man's attempt to create an economically viable agricultural area has not only caused changes in populations and species occurrence, but has resulted in environmental competition between man and animal.

The southern portion of the study area offers a striking contrast to the northern portion. Here agriculture has been established slightly longer[2] and land clearing is more complete. More of the large fields are suitable for crop production. The wildlife problems are different; great numbers of migratory waterfowl feed on the large, slough-dotted grain fields before flying south in the fall.

In addition to the advantages of fauna variety and an expanding agricultural environment, accurate records of animal damage complaints by farmers have been kept with consistency for longer than the study period of five years.

Another factor, although not crucial in the choice of the area, was the knowledge that many residents have been agitating for further increases, by restocking, of big game populations. This agitation by

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[1]Northern and Southern portions refer to those parts of the study area lying north or south of the Athabasca River.

[2]Some early settlement dates are: South of river, Westlock C 1905; Athabasca C 1904; North of river, Sawdy C 1911.

individuals, as well as local sporting groups has occurred concurrently with many depredation complaints involving numerous species. (Nalbach, 1969, Pers. Comm.)

In this study the major emphasis has been on analysis of farmers' attitudes towards the wildlife hazard. In order to characterize and identify these attitudes a direct personal interview with a prepared questionnaire (Appendix A) was used. One-hundred farm operators were interviewed, fifty of whom had reported wildlife damage. Ninety-six of the informants lived in the study area and were interviewed in their homes, farm buildings or fields. Four informants are now in permanent residence outside of the area.

All of the information pertaining to wildlife damage within the study area, aside from that secured from the one hundred farmer informants, has come from government records and personal interviews with government officials. General background material on the area has come from books, government studies, pamphlets, and personal observation. The materials on wildlife depredation in other areas has come from many sources. Officials from private organizations, the U.S. Federal government, and one state government (Pennsylvania) were interviewed. Many of these people were able to supply published and unpublished data.

Although many of the area's physical and cultural features are to be found elsewhere in similar complexes, it is not possible to conclude that the area is 'representative'. Generalizations may be drawn from this study, but their applicability to other areas would be questionable unless further work is done.

The relationship between man and nature is, needless to say, complex. It is hoped that this study has made a small contribution to understanding that relationship and stimulated others towards further explorations that together might allow some confident generalizations.

CHAPTER I

PHYSICAL AND CULTURAL FEATURES OF THE ATHABASCA OFFICER DISTRICT

1.1. Physical Background

The A.O.D. of the Alberta Fish and Wildlife division is an administratively defined area of 5,481 square miles in north central Alberta. In general terms the area lies between the 54 degree and 55 degree 35 minute parallels of north latitude. The eastern and western boundaries may be roughly defined as the 112 degree 40 minute and 114 meridians of longitude respectively. No legal description of the area exists. (Fig. 1).

Although this study has considered all of the area in terms of wildlife depredations on agriculture it is concerned mainly with the southern two-thirds portion of the district where most commercial agricultural production occurs.

1.1.1. Drainage and relief

The area is drained by the Athabasca River and its tributaries, and major tributaries of the North Saskatchewan River (Fig. 2). The Redwater River, in the extreme southern part of the study area and the Namepi Creek in the southeastern section are part of the North Saskatchewan system. Important tributaries of the Athabasca River are the Dapp and French Creeks (via the Pembina River which is not in the area) in the southwest and south central areas respectively, and the

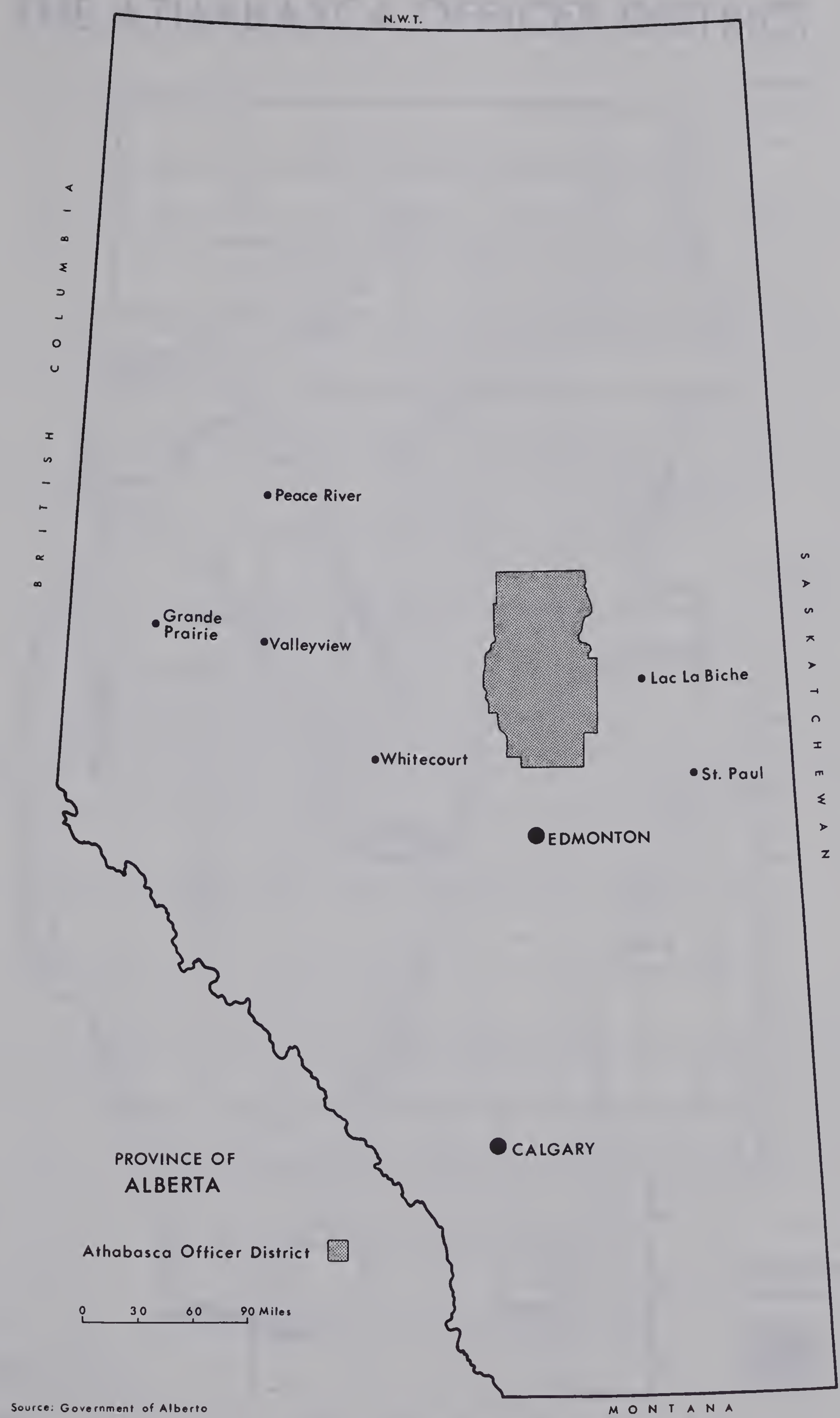
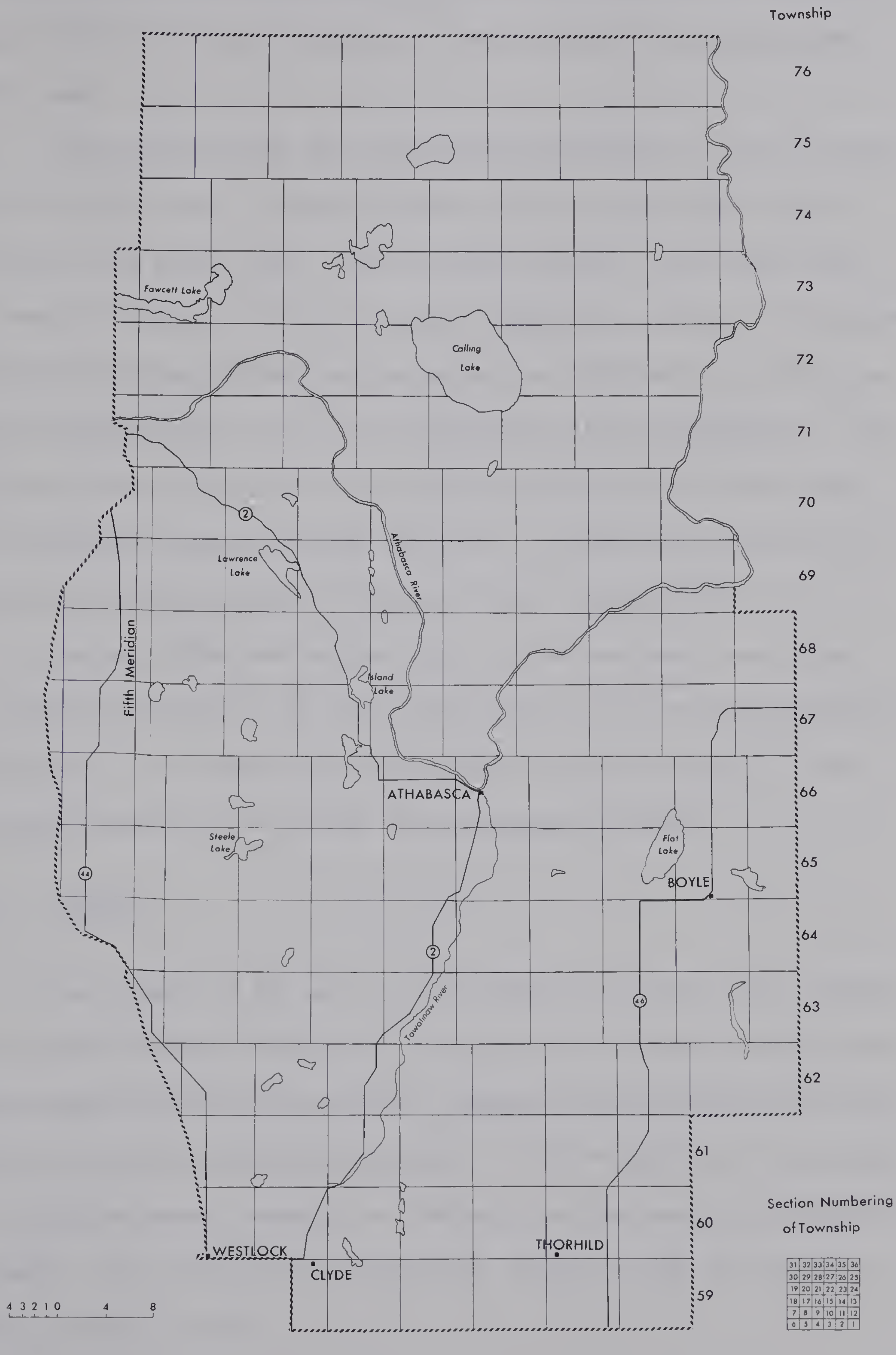

N.W.T.
BRITISH COLUMBIA
SASKATCHEWAN
MONTANA
Peace River
Grande Prairie
Valleyview
Whitecourt
Lac La Biche
St. Paul
EDMONTON
CALGARY
PROVINCE OF ALBERTA
Athabasca Officer District
0 30 60 90 Miles
Source: Government of Alberta

Figure 1

THE ATHABASCA OFFICER DISTRICT



Source Department of Lands and Forests, Government of Alberta Field Work, 1969

Pine Creek (via the La Biche River) in the northeast area, Tawatinaw Creek in the south central area, and the Calling River in the north central area.

The larger streams mentioned above are deeply incised into the almost flat tableland. These incisions are the only large relief features in the study area. The tableland varies in altitude from 1900 feet to 2300 feet with all changes being very gradual. The bottom-lands of the stream valleys may be as low as 1650 feet as in the case of the Athabasca River at its confluence with the Calling River. The Tawatinaw Creek valley which bisects the southern half of the study area is another example of deep incision. In many places there is a 300 foot difference between valley and table land altitude.

The only other relief features of note are small sand dune areas where altitudes of 30 feet above the surrounding countryside are encountered. The largest sand dune areas lie east of Clyde, in the Cross Lake Provincial Park area, and southeast of Smith.

1.1.2. Climate

The climate of the area is Continental with short warm summers and long cold winters (Table 1). The cold winter temperature may sometimes be ameliorated by warm frontal systems moving eastward from the Pacific across the continental divide. If the temperature rises above 40°F during December, January, or February the phenomenon is termed a 'chinook'. This occurs on an average of 10 days a year at Athabasca (Longley, 1966, Fig. 3).

Variations in mean annual precipitation of up to 2.0 inches appear to be of little consequence to agriculture. No gross changes in farm crop types or native species of flora have been noted as a response to precipitation. The 16 to 18 inch mean annual precipitation in the area is generally adequate for cereal crop production. Only in years where the precipitation falls below 16 inches does severe drought loss result. Correct soil management, utilizing moisture conservation practices, alleviates most inadequacies.

The length of the frost-free period in the area is a matter of controversy. When examined from a microclimatological point of view large variations of up to 40 days are noted between stations in the study area. These variations may be a result of station location in relationship to the local topography. Cold air drainage and other meteorological phenomena controlled by local relief vegetation patterns and water bodies alter local climate. Although these variations may affect farming practices on particular fields or farms within the study area it is not known whether farming success or general patterns of farming are greatly altered because of temperature variations (Hayter, 1970, Pers. Comm.)

Alberta Department of Agriculture maps based on 1951-1964 figures suggest that the southern quarter of the study area has an average of 80 to 100 days (Alberta Farm Guide, 1967, p.15).

Climatic data relevant to the foregoing discussion are presented in Tables I and II.

Table I - Precipitation by Month.

Month	Athabasca[1] Temperature (Mean °F)	Athabasca[1] Precipitation (inches)	Thorhild[2] Temperature (Mean °F)	Thorhild[2] Precipitation (inches)
January	1.6	1.17	2.2	0.77
February	6.2	1.97	7.1	0.69
March	17.2	0.85	18.5	0.77
April	36.6	0.82	37.1	0.89
May	48.8	1.80	51.1	1.62
June	55.3	2.77	56.8	2.70
July	60.5	3.00	61.8	2.80
August	57.9	2.50	58.3	2.35
September	49.4	1.39	49.4	1.35
October	38.8	0.84	38.5	0.80
November	21.4	1.03	21.0	0.82
December	7.6	1.13	6.4	0.71
Total	33.5	18.27	34.0	16.27

[1] Period of Record 1931-1960.

[2] Period of Record 1931-1960.

Source: D.O.T. Climatic Normals

Table II - Length of Frost-Free Period.

Station	Years Averaged	Frost-free Period (Days over 32°F)
Athabasca	1951-64 (7 or more years)	84
Thorhild	1951-64 (7 or more years)	98

Source: Longley, 1967.

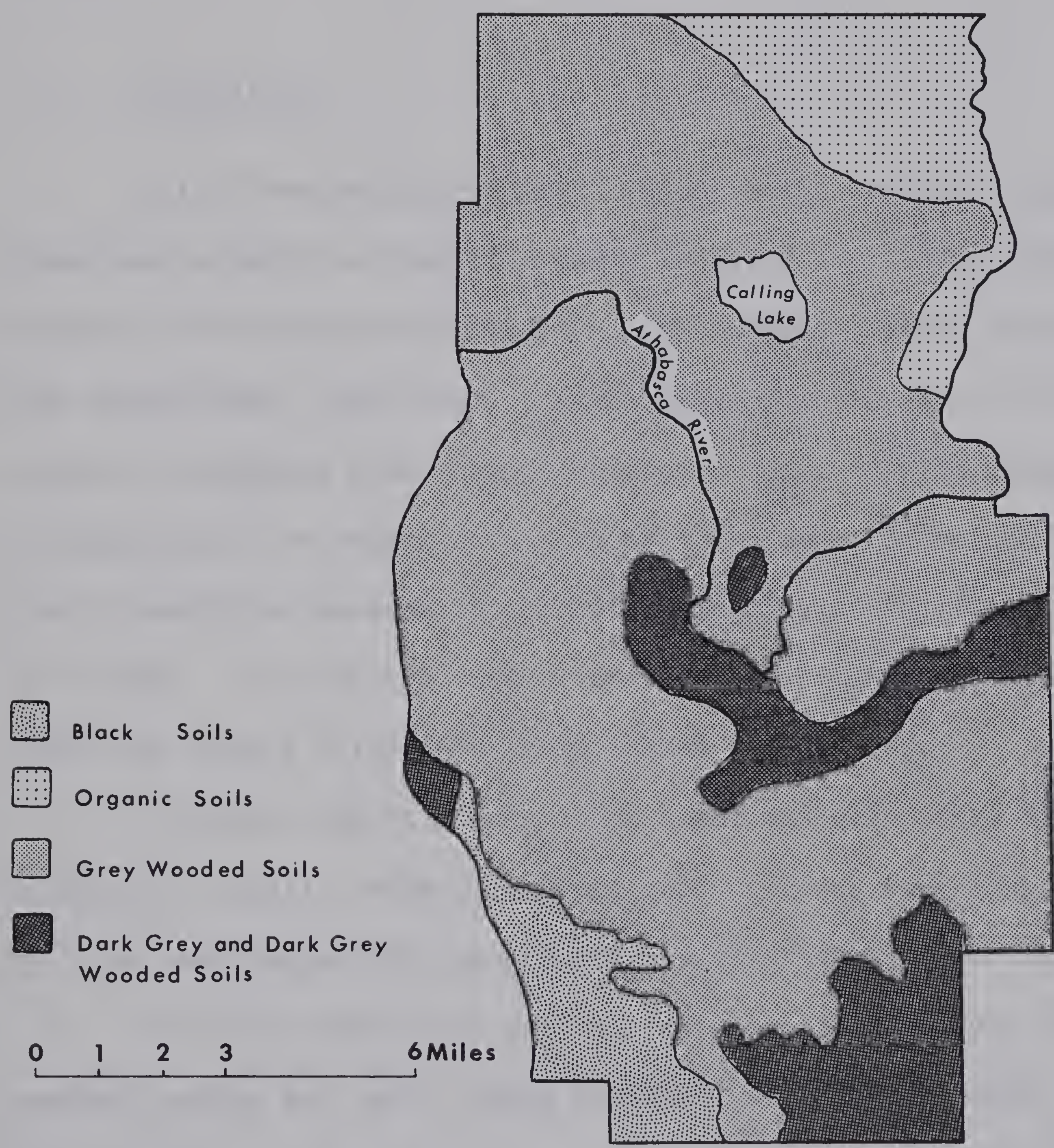
1.1.3. Soils

Two main soil groups are represented in the study area. The soils of the most southern townships belong to the dark grey and dark grey wooded group. Some soils of this group may also be found in a small crescent-shaped area to the west, south and east of Athabasca (Fig.3). The soils in the remainder of the area belong to the grey wooded group (Odynsky, 1962).

Soils of both of these groups are very similar, the main difference being the greater degree of nutrient deficiency in the grey wooded group. The top organic layers are thin or absent and leaching has occurred in the A. horizon. Phosphate, nitrogen, and sometimes sulphur are deficient. In order to overcome these deficiencies a system of mixed farming employing orderly crop rotation is necessary. The more successful rotation cycles have included cereal grains, grasses, and legumes (Newton et al., 1959, p.51).

The Alberta Farm Guide (1967, p.46) suggests that a six year rotation with three years of grain and three years of forage crops is

SOIL GROUPS OF THE ATHABASCA OFFICER DISTRICT



SOURCE: ODYNSKY

Figure 3

practical in the gray wooded soil zone. The interval between the planting of forage crops should not be less than two years nor more than four years. The most popular grains are wheat, barley, and oats. The most popular forage crops are alfalfa, clovers, brome, timothy, and fescues.

1.1.4. Vegetation

All of the study area is included in the extensive Boreal mixed wood vegetation zone of Alberta (Hardy, ed., 1967, p.153). The forests of this zone contain *Populus balsamifera*, balsam poplar; *Populus tremuloides*, aspen poplar; *Picea glauca*, white spruce; and *Pinus contorta*, lodgepole pine in varying proportions. As the proportion of *Populus* spp. increases so also does the biomass or volume of ground vegetation because of decreasing acidity of the forest floor environment. This ground vegetation composed of grasses, herbs, and forbs may support relatively large animal populations.

In older forests *Picea glauca* sometimes with *Abies balsamea*, balsam fir, usually replaces *Populus* spp. or *Pinus banksiana*, Jackpine. If fires are frequent this succession is retarded or never occurs.

In lower areas where drainage is poor, black spruce *(Picea mariana)* muskeg and larch *(Larix laricina)* swamp predominate. Extremely wet areas, such as lake and slough margins, where Spruce and Larch are unable to survive, willow and marsh reeds flourish. The only general exception to these boreal mixed-wood characteristics occurs in sand dune areas where *Pinus banksiana* is the dominant species (Hardy, ed, 1967, p.156).

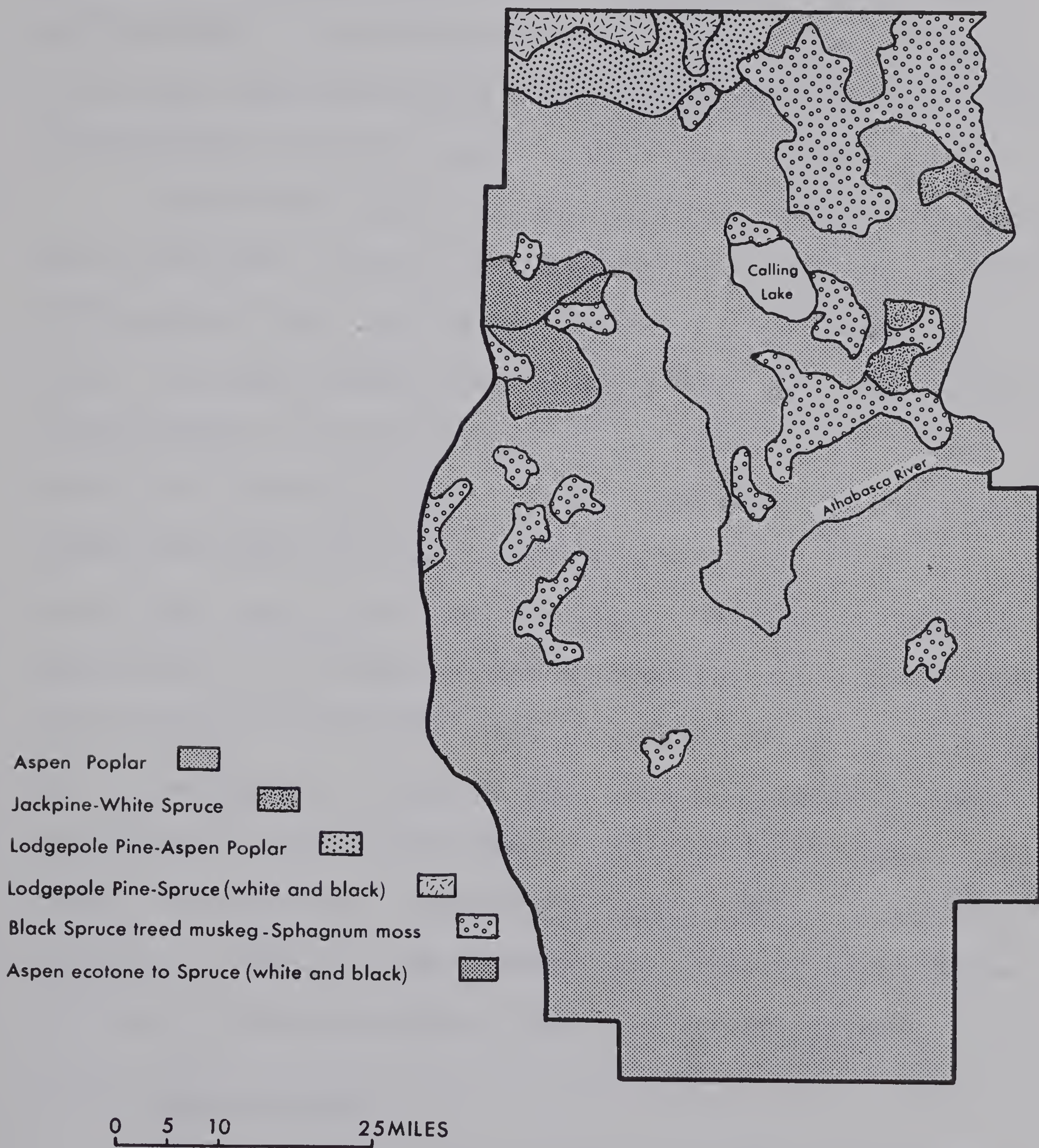
The vegetation cover types and their extent have been severely altered since agricultural settlement began in the early part of this century. Today large portions of land are cleared of all forest cover. Deforestation took place following the occupation of all naturally open land and also by small local lumbering interests. In the southern one-third of the study area the only remnants of natural vegetation are those areas impossible to farm because of drainage problems, steep slopes, or hummocky terrain. Towards the north the degree of clearing diminishes. North of township 70 clearing is carried out only for some sites and during lumbering. Most of this area has not been and is not open to agricultural settlement (Fig. 4).

As a result of the very high degree of human interference with natural vegetation it is difficult or impossible to establish the natural ratio of open land to forested land over most of the area. Stone (1970, Pers. Comm.) utilizing early documents as well as personal interviews in a historical settlement study of 9 townships near the Athabasca townsite suggests that about 32 per cent was semi-open or brush covered and the remainder was wooded.

1.1.4.1. The Influence of Fire on Vegetation

The role of fires in altering vegetation patterns and, hence, animal habitats should be noted. Allen (1962), p. 65), and Dasmann (1966, p. 81, 1968, p. 242) have discussed the often beneficial aspects of fire to ungulate populations in forests reaching climax stages. In those areas where climax vegetation consists of a heavy and dense forest cover, mediating against growth of sufficient amounts of herbs,

NATURAL VEGETATION OF THE ATHABASCA OFFICER DISTRICT



Source: Atlas of Alberta

Figure 4

forbs, and browse ungulate populations are depressed. If fire ravages such an area ungulate populations rise and peak during those successional growth stages where herbs and forbs are available in relatively high densities. Dasmann (1968, p.242) has shown that logging has a similar effect on habitat and population. In the California coastal forests deer populations peaked about 7.5 years after logging or fires. Forbs were the predominant vegetation during the population peak.

Unfortunately detailed logging and fire histories of the A.O.D. are not available. Without this information it is impossible to discuss vegetation cover, and its relationship to animal numbers over time. It is known, however, that scattered small scale logging operations have been carried on since settlement (Government of Alberta, 1961, p.3). The Alberta Forest Service, Forest Cover Map (1957) indicates that many small fires have occurred throughout the A.O.D. since 1940. Less is known about the periods 1905-1940 and 1957-1968. Nevertheless it is probably reasonable to surmise that fires were common during the intensive land clearing operations during the early years of settlement, c. 1910 - C. 1925. During the summer of 1968 a large portion of the northwest section of the A.O.D. was burned in the 'Lesser Slave Lake Fire'. Without more specific data it is difficult to assess the feeling of many informants that animal populations have increased with the suppression of fires over the past 30 years.

1.1.5. Animal Geography

No precise records of pre and early settlement period animal geography in the study area exists. Early explorer's diaries occasionally mention the sighting of the larger species not familiar to Euro-

peans, but do not often elaborate and are therefore of little value (e.g., Mackenzie, 1911). The first accurate scientific records of animals in the study area were kept by William Rowan of the University of Alberta. Rowan, who was primarily and ornithologist, visited the area frequently from 1920 to 1957 and kept field notes on bird sightings and counts. These records are not included here because of their narrow scope.

Species of birds and mammals found in the area at present follow in the Appendix (B).[1] This has been compiled on the basis of Soper's (Soper, 1964) maps of mammal ranges and Salt and Wilk's (Salt and Wilk, 1966) maps of bird ranges. Although frequency of occurrence of these species in the area is sometimes difficult to determine it is noted whether the animal is a migrant, occasional visitor or resident. Some species may only be found in a portion of the study area.

1.2. Human Background

1.2.1. Settlement and Agriculture

The study area is largely rural in character, having only two towns of significant size, Athabasca, 1768 people and Westlock 2919 people (Canada Census, 1966). All other centers have less than 500 residents. The 1966 census classified 4753 people of the study area as 'non-farm' and 10,378 as farm residents. Total population by the 1966 census was 15,131 people. The total population by the 1961 census

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[1] These lists give taxonomic names, and the common names which are used throughout the text.

was 16,185 people thus some depopulation has occurred and may still be occurring.

Population density figures for political subdivisions of the study area cannot be computed because data were collected on the basis of enumeration areas created expressly for census purposes. Generally, however, it can be said that rural densities are fairly similar from the southern extent of the study area north to about township seventy. North of township seventy on the north side of the Athabasca River no agriculture is in evidence. North of township seventy on the south side of the river agriculture is limited and most land is still held by the Crown. The northern boundary of agriculture coincides very closely with the Alberta Department of Lands and Forests 'Green Zone' designation. The Green Zone is not open for agricultural development and within the study area is occupied mainly by Metis and Indian groups. These groups are dispersed and do not live in densities approaching that in the southern parts of the study area. The overall density of the study area based on the 1966 census is 2.76 persons per square mile.

Ethnic data of questionable value were collected in the 1961 census. All residents have been assigned to an ethnic group on the basis of the most recent foreign origin in the direct male line of the individual, regardless of the number of generations that the male line has been in Canada. The consequence of this classification system is that no one is a Canadian. Below is a list of ethnic groups and their respective numbers in the study area.

Table III - Ethnic Groups in the Study Area

Origin	Number
British Isles	4,416
French	1,284
German	1,791
Italian	46
Jewish	1
Netherlands	241
Polish	1,610
Russian	140
Scandinavian	899
Ukranian	4,075
Other European	1,015
Asiatic	29
Indian-Eskimo	395
Other	188
Total	16,185

Source: Census of Canada (1961).

Educational attainment based on the 1961 census shows the educational attainment of those not attending any sort of educational institution at the time of the census.

Table IV - Educational Attainment in Study Area

Level of Attainment	Number
No School	2,968
Pre I	3
Elementary 1-4	1,241
Elementary 5-8	4,276
High School 1-2	1,928
High School 3-5	1,198
University 1-2	212
University 3-4	47
University degree	80
Total	11,953

Source: Census of Canada (1961).

Income data were also collected in the 1961 census. These data are also of questionable value owing to the method by which they were collected. Local enumerators were hired to interview residents within their home area. Often the enumerator knew his interviewers consequently false income figures may have been given to the neighbor-enumerator.

The mean wages and salaries per family are $2793. Wages and salaries by enumeration area vary from nothing to $8900 per family.

1.2.2. Crop Production

Crop production figures are not available on an enumeration area basis. Therefore figures for Census Division 13 are given as the best estimate. C.D. 13 includes all of the study area as well as Barrhead county, which has substantially the same soil and climatic conditions as the study area. In analysing these figures the fact that all averages are based on harvested acreage must be kept in mind.

Table V - Census Division 13 Cereal Yields

	Yield (Bushels per Acre)			Gross Income (Dollars per Acre)		
	Barley	Oats	Wheat	Barley	Oats	Wheat
1962	29.8	46.6	24.1	25.12	25.03	35.21
1963	26.6	40.5	21.9	24.08	20.75	36.84
1964	31.0	46.0	25.3	30.23	26.98	36.71
1965	24.3	36.1	24.0	24.15	23.90	38.24
1966	36.6	50.1	30.4	36.98	33.25	50.68
1946-1966						
Low	13.60	21.50	10.00	13.87	13.97	14.65
High	36.60	51.10	30.40	36.98	33.25	50.68
Mean	27.17	40.58	23.51	23.67	23.00	33.57

Source: Crop Production Risk in Alberta.

Farm size data by enumeration area are similarly lacking. The average farm size for C.D. 13 in 1966 was 512.0 acres. The average farm size by subdivisions was; Athabasca County, 605.5 acres; Thorhild County, 436.8 acres; and Westlock Municipal District, 500.3 acres (Census of Canada, 1966).

Farm land-use data for C.D. 13 is shown in Table VI. These data are not available on a subdivision or enumeration area basis.

Table VI - Census Division 13 Agricultural Landuse

Census Division 13	Acres	Percent of all C.D. 13 Farmland
Total improved area on farms	1,375,967	66.0%
Under crops	979,581	47.0%
Improved pasture	156,201	7.4%
Summer fallow	201,164	9.6%
Other improved	39,021	1.9%
Total unimproved land area	709,495	34.0%
Woodland	216,260	10.4%
Other unimproved	493,235	23.7%
Total area on farms	2,085,462	100.0% (34.7% of C.D. 13)
Total land area	6,001,920	

Source: Census of Canada, 1966.

CHAPTER II

PREVIOUS STUDY OF AGRICULTURAL DEPREDATION BY WILDLIFE

Depredation in its broadest sense is the infliction of damage of either a qualitative or quantitative nature upon agricultural properties. An implication of this definition is that every farmer will suffer some sort of depredation because of his dependence on a natural environment that usually contains animals. Most farmers are willing to accept these depredations as long as their welfare is not altered to an intolerable state over which they have little or no control. The identification of the point at which a farmer feels his welfare has become jeopardized is, of course, subjective. Therefore, depredation might be more realistically defined as the infliction of damage beyond the point which the individual farmer is willing to tolerate or call 'normal'.

Animal depredation on agriculture is a worldwide problem. The weaverbirds in Africa have been described as possessing the power of life and death over families operating small subsistance grain farms (Cummings, 1966). Formazon and Isakov (1963, p.V) have described avian and rodent depredation problems in Soviet agriculture. Corbett (1948, p.22; 1946, p.16) noted incidents of predation by Felidae on livestock in India. Many Western European workers (e.g., Kear 1963, p.66) have also discussed agricultural damage problems.

North American workers, perhaps more than those from other parts of the world, have intensively studied the problem of agricultural depredation by wildlife. Several possible explanations for

this may be offered. North America has been settled and opened to large scale commercial agriculture very recently. These recent, dramatic man-made land use changes have not allowed the more gradual adjustments in man-animal relationships that have taken place in areas where primitive agricultural systems are in operation or where agriculture methods have evolved from the simple to the complex over a long period of time, e.g., Europe.

North American agriculture has been the first to evolve under the influence of a body of conservationist doctrine. (It is acknowledged that the early conservationists had relatively little influence, however, they did establish a tradition and a public interest that enlarged over generations.) European agriculture had evolved certain farming methods as concessions to local conditions. Sometimes these methods exerted an influence on wildlife numbers and behavior, however, this was oftentimes incidental to the central purpose of the method change. Many of the species that may have been involved in depredations, e.g., wolf, bison, lynx had been extirpated from agricultural areas or rendered extinct before any conservationist philosophies were widely accepted.

North American agriculture was still expanding after such people as Audubon, Thoreau, and Muir had disseminated their simple preservation ideas. During the peak of agricultural expansion the passenger pigeon became extinct. The western pioneers saw the dramatic extirpation of the American bison from its range. Both of these animals had been noted for their almost infinite numbers. Passenger pigeon flocks were so large that they darkened the skies. Bison

numbering in millions roamed the plains (Dasmann, 1968, p.231). The great reductions of animals were apparent to much of the public who utilized wildlife for food. The public as well as the newly formed preservation and sporting groups put pressure on governments to stem the increasing loss of the wildlife resource. California and New Hampshire started game commissions in 1878. These commissions were charged with the duty of conserving wildlife. In 1887 Michigan, Minnesota, and Wisconsin started hiring permanent salaried game wardens to enforce hunting regulations. In addition to the establishment and enforcement of regulations the various administrative agencies tried to educate the public to the value of government trusteeship. After the turn of the century refuges and preserves were established to facilitate the increase of species that were low in number and to produce more game (Dasmann, 1968, p.232).

When government became responsible for wildlife management it also became responsible for helping the farmer with his wildlife problems that he no longer had the legal power to alleviate at his own discretion. This shift in responsibility signals the era of scientific inquiry into the control of wildlife depredation on agriculture in North America.

2.1. Methods of Controlling Depredation

Depredation control may be divided into four basic categories (Bossenmaier and Marshall, 1958, p.26). With the explanation of each category examples from the literature are given. Where possible the literature chosen for exemplification has particular relevance to the

study. It should be pointed out, however, that very little literature has been concerned with Alberta control and depredation problems.

2.1.1. Cultural Methods

Cultural methods of control are the adoption of farming practices that reduce animal damage problems (Bossenmaier and Marshall, 1958, p.26). With the advent of the combine on the prairies, circa 1928, waterfowl damage to grain crops increased. The increase was due to the large amounts of cut grain drying on the ground during the interval between swathing and combining. Bossenmaier and Marshall (1958, p.26) believe that a change in farming method, i.e. straight combining without swathing, would reduce losses to waterfowl by elimination of cut grain drying on the ground. Such a change would be a cultural control method. Other cultural control methods would be changes to less palatable crops near congregation areas, and the delay of fall tillage, which tends to attract waterfowl, until the harvest is complete.

The difficulties inherent in these and other cultural control methods cannot be overlooked. The costs of implementation may be high. Some of the complications in the above cases, for instance, might be; decreased grain yields because of the required switch to earlier maturing grains necessary for straight combining; the necessity for different farm machinery if crop changes are needed; and changes in marketing practices.

Cultural control methods have generally received little attention in the literature. This lack of interest in these methods may be

because of the difficulties in uprooting farmer tradition. The size of the area where any particular cultural method can be used may also limit implementation. Some of the factors affecting the areal extent of a cultural method are climate, local crop preference, wildlife species range, topography, and possibly ethnic tradition.

Most cultural control methods are mentioned by investigators working with particular species in restricted areas. Berryman (1966, p.2) for example has noted the shift to crops other than corn by farmers in certain Ohio counties who have suffered severe and chronic blackbird damage.

2.1.2. Defensive Methods

Defensive methods are those methods that attempt to keep any depredating species from entering a crop or property where they might cause depredation. Bossenmaier and Marshall (1958) mention several defensive methods for the prevention of waterfowl damage. These include scarecrows, acetylene exploders, rotary and flashing electric beacons, bombs, rifle grenades, firecrackers, herding by humans on foot or horses, and in airplanes, screening of crops, and chemical repellents. Roberts (1964, p.12), Denney (1955, p.133), and Kinghorn (1950, p.48) have mentioned special haystack and field fences for protection from deer and/or elk damage.

Defensive methods for the prevention of damage to stock are more difficult because of the mobility of both predator and prey. The U.S. Forest Service (anon. 1965, p.2633, 4--1) and Matson (1967, p.106) have both suggested that noise discourages bears from attacking people

and stock. The U.S.F.S. recommends the use of bells on grazing pack stock. This is also practiced in some of Western Canada's national parks. Noise probably does work as a deterrent in cases where depredations are the result of a fright reaction due to sudden unexpected confrontation. There is no evidence, however, to disprove that a hungry depredation prone bear might, in fact, be attracted by noise.

Fencing in many cases is not a viable alternative because of the large areas involved and the ability of most predators to jump or break a fence if they wish. Fences may have application in particular situations. Storer (1938, p.172), for instance, recommends electric fences for the protection of mountain apiaries.

Defensive methods may also be used for the protection of buildings and other farm fixtures. Many papers and manuals produced by government agencies have described the erection and reinforcement of buildings to prevent rodent damage. Gurba and Stelfox (1961, p.5) in a Province of Alberta publication designed for general distribution have discussed rat proofing techniques for farm buildings. These techniques include concrete foundations at least two feet below ground and one and one-half feet above ground; screening of all ventilators and windows; metal flashing on the bottoms of doors; sufficient elevation of granaries to allow light penetration beneath them; and the use of concrete construction where possible. The Canada Department of Agriculture also circulates a pamphlet advocating similar practices; Control of Rats and Mice (1968).

2.1.3. Aggressive Methods

Aggressive methods are those methods aimed at decreasing the numbers of wildlife in any farm area (Bossenmaier and Marshall, 1958, p.26). In the case of waterfowl aggressive methods may require only the more widespread use of defensive methods so that the birds are discouraged from landing or stopping in the cropped as well as crop-less land of a particular area.

More commonly aggressive methods involve the use of poisons, repellents, sterilizing agents, traps, and guns. Aggressive methods are used more often on non-game species because of the lack of regulations dictating method and time of kill. Within the study area only three protected animals, the beaver, bear, and waterfowl are subject to aggressive control methods. The destruction of depredating waterfowl and beaver outside the legal hunting and trapping season require a damage permit from a Fish and Wildlife officer (Appendix C). On the other hand a farmer does not need a damage permit to shoot a bear if it is causing damage on his farm property.

Until recently the literature had stressed aggressive methods very heavily. With the increased awareness of environmental conservation by the public, these methods are receiving less emphasis. An example of this change has been Alberta's revision of the coyote's status. This animal was recently added to the 'protected list', thus removing the threats to its numbers that the use of unrestrained aggressive control methods permitted.

In many instances aggressive methods have proven to be very expensive and impractical. (Allen (1962, p.264) has conclusively demonstrated the futility of the numerous bounty schemes and predator control programs that have operated in the U.S. and Canada for more than 100 years in some instances. These programs have cost millions of dollars and have rarely been beneficial from either a control or conservation point of view.

Lindzey (1960, p.119) and Cummings (1967, p.237) amongst others have suggested that aggressive methods should be reserved for cases where destructive agent can be highly selective, so as to avoid undesirable effects on non-target individuals or species. Selectivity at present is very difficult to achieve with any aggressive approach not requiring continuous supervision. Most trapping and chemical methods can easily affect innocent species or individuals.

The Province of Alberta has constantly recommended to, and supported farmers in aggressive control efforts. Through the network of district agriculturalists and agricultural fieldmen the province has offered advice and material to all who request it (Gurba, 1969). In conjunction with this advisory program a great deal of literature has been distributed. Some sample titles are: Poisons for Coyote Control, (Lobay, 1953); Directions and Precautions for Using Coyote Getters, (Lobay and Wilson, n.d.); Control of Pocket Gophers, (Miller, 1966); Magpie Control in Alberta, (Gurba and Stelfox, 1963).

2.1.4. Preventative Methods

Preventative methods are those methods that improve feeding and/or habitat conditions at the expense of non-agricultural interests. Some of the preventative methods that have been used are: the establishment of refuges for resting areas, lure crops, and damage reimbursement schemes (Bossenmaier and Marshall, 1958, p.27). Generally these methods are only employed when the damage suffered by farmers nears the intolerable point, or farmer control exercised on the depredating species becomes intolerable to other interested parties, such as hunting or conservation groups. When these points are reached only action of a constructive nature, i.e. preventative control, can resolve the situation.

Preventative methods have not been as popular as other methods because of the greater degree of advanced planning, cooperation among all interested parties, and expenditure required for implementation and continuous management.

Preventative methods have been employed in areas where agricultural land-use is intense and of such high value that depredation to even a small extent cannot be tolerated. California has purchased private holdings in important produce production areas to use for lure cropping and animal refuge (Biehn, 1951, p.70). Preventative methods have also been used in areas where special interest groups fear extirpation of certain species by farmers resorting to aggressive control measures. Pennsylvania has purchased and leased small holdings in suburban and agricultural areas for the protection and propagation

of small game and deer that are not tolerable in sufficient numbers, on farms. These areas are open to naturalists, and hunters in season (Roberts, 1969, Pers. Comm.; Freeburn, 1962).

At present there are only five states and two provinces which have damage reimbursement schemes[1,2] (Renewable Resources Report, 1969, p.3). All of these states and provinces have had severe damage from migratory birds and/or winter ungulate concentrations. The Migratory Bird Convention Act and the Migratory Bird Treaty require states and provinces to closely supervise hunting and set regulations according to annual population estimates. To prevent abuse of these regulations by farmers who live on flyways and suffer damage annually, reimbursement schemes have been established. Reimbursement schemes have met with varying success. No scheme has been entirely satisfactory to the government or the farmer (Renewable Resources Report, 1969, p.4).

Preventative control appears to be the bellwether of future control efforts. This mode of control is the only one stressing constructive concepts. Although the other modes of control will continue to be the most viable in certain situations they do not appease all interested parties as the ideal preventative method does. The strong sentiments for increased environmental quality can only be respected if more preventative control is used.

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[1] Colorado, Kentucky, Ohio, Wisconsin, Wyoming, Alberta and Saskatchewan.

[2] These totals do not include states and provinces having legislatively fixed amount funds for payments for damage by one or a few species.

Although the cultural methods are not destructive they are not as positively directed as preventative methods. Cultural methods are restricted in geographical area and only limit or prevent animal penetration. They do not offer the depredating animals an alternative to depredation in some other locality, as the preventative method does.

2.2. The Alberta Wildlife Damage Fund

Alberta operates a compensation system for farmers who have suffered certain specified wildlife damages. A Wildlife Damage Fund was established in 1961 (R.S.A., 1961, C. 88). This fund underwent several administrative changes until 1964, when it was reconstituted under the Game Act (R.S.A. 1955, C. 126, S. 125a, SS. 2). Since 1964 the regulations governing the operation of the fund have undergone several ammendments and revisions. Currently Alberta Regulation 292/68 is in force (Appendix D).

Two dollars from the purchase fee of every hunting license is contributed to a fund administered by the Alberta Hail and Crop Insurance Board. Should a farmer suffer damages he must contact a local adjuster of the board who will inspect the damages for a fee of $25 per quarter section. The adjuster will assay the damage according to the prescribed methods and submit a report to the board requesting payment of up to $15 per damaged acre to the farmer.

The Alberta Wildlife Damage Fund does not have a payment limit per single farm or a fixed ceiling on total payments. The legislature is obligated to supplement the fund if it becomes insolvent. Also, the farmer is not required to enlist or make any monetary contribution (as

with insurance) before damage has occurred. The only other reimbursement system in Canada, that of Saskatchewan, is an insurance plan operated with farmer paid premiums and hunting license assessments (Paynter, 1955, p.153).

2.3. The Ecological Background of Depredation

This material consists of descriptions of habitats, behavioral patterns, food habits, migration patterns, and breeding. Knowledge of these areas is necessary to implement control and to identify causes and reasons for depredations. Examples from some of the more important literature are given below. Some aspects of this material will be given further discussion in Chapter 4.

Bossenmaier and Marshall (1958, p.21, p.24) in their study of waterfowl depredation in Manitoba, have developed data on grain preferences and feeding schedules. Barley and wheat were the most preferred grains, but oats and flax were occasionally consumed. Generally there were two feeding flights per day, at morning and evening. Only during inclement weather was there a mid-day feeding flight. Light-intensity, hunger, and weather conditions appeared to govern movement. The more adverse the atmospheric conditions, the more irregular were the feeding schedules. If not disturbed the birds usually chose the field closest to the lake where they were staying for feeding.

Winner (1959, p.202) has discussed the effects of light intensity and mean daily temperature on field feeding periodicity of mallards and black ducks in Ohio. He was able to demonstrate that there was a significant correlation between the time of the afternoon feeding

flight and the percentage of mallards in the total population. There was also a significant correlation between the time of the afternoon flight and the total population. The flights began earlier, in relation to sunset time, when the total population was greater and/or the percentage of mallards was greater.

Jordan (1952, p.121) studied the cereal grain consumption of waterfowl of different species and ages. Relevant to this study are his findings on grain consumption by mallards and Canada geese. Mallard drakes consumed .14 pounds daily and a mixed sex and age group of Canada geese averaged .36 pounds per day. Bossenmair and Marshall (1958, p.24) have estimated mallard consumption in their Manitoba study at .438-.570 pounds per day. No explanation is readily available for these differing mallard consumption rates.

Coyotes have often been blamed for agricultural depredations. O. J. Murie (1935, 1945) has carried out three coyote food habit studies based on stomach content analysis. In his 1935 study of Jackson Hole, Wyoming coyotes he concludes (p.22) ". . . 70.29 per cent (of the coyotes diet) may be credited to the animal as indicating economically beneficial feeding habits; 18.22 per cent may be classed as neutral, and only 11.49 per cent may be charged against the coyote." Murie's 1945 studies of British Columbia and Montana coyotes ends on a more controversial note (p.40).

> If I may presume to summarize the feeding habits of the coyote, I may say that it usually seeks an abundant animal form, whose habits are such that it lends itself to easy capture on a scale large enough to furnish a staple food supply . . . . From the economic standpoint, it can be expected that when livestock becomes easily available, especially when the natural food fails, the coyote readily takes advantage of the opportunity. This could be expected in the North when the snowshoe rabbits fail, and domestic sheep herds are present.

> Therefore, the subject of coyote food habits becomes a local problem, not only from the economic standpoint, but also from the standpoint of pure science, depending on the local ecological picture.

The attack methods of grizzly bears have been described by A. Murie (1948, p.68). He has documented the pattern of attack and post-kill eating preferences from 20 cases of attacks on cattle. The bear seizes head or fore quarters of the animal with its paws and then repeatedly bites the dorsal side of the neck until the animal falls. Then the brisket, the meat on the proximal ends of the ribs, and the heart, liver, and lungs are consumed. Calve and yearling age class animals were the only ones attacked. Time of attack seemed quite random. No in depth studies of black bear predation on livestock have been made. Murie, (p.70) however, suggests that their mode of attack may be very similar.

2.4. The Economic Significance of Wildlife Depredations

Some investigators have attempted to measure a species' worth in terms of its contribution to the economy. These studies have often been done when governments are faced with trying to formulate management policy for a species when several interested groups are in conflict. A good example of such a study is Thomas' and Pasto's (1956) work entitled "Cost and Benefits of the Deer Herd: An Economic Analysis of Deer Management in Two Pennsylvania Counties." In this study the interest of four competing groups were considered. ". . . the first is society, which is composed of the other three -- farmers, deer hunters, and businessmen. These groups are not always mutually exclusive, but each has its own

objective" (p.31). To both the hunter and the farmer tangible costs outweighed tangible benefits. The reverse was true with the businessmen. The authors were either unable or unwilling to discuss monetary costs and benefits in terms of society. The pitfall of any study such as this is the inability to quantitatively measure the intangibles. No dollar value can be assigned to aesthetic or recreational benefits. The propriety of these studies may always be questioned when comparisons of intangible costs and benefits are attempted.

Much of the early depredation and control literature was loosely categorized as 'economic'. This classification seems to have been based not so much on the author's approach, but merely on the fact that he was dealing with a subject that had an economic ramification rather than a, say, sporting or legal ramification. Munro (1949) published "A Study of the Economic Status of the Sandhill Crane in Saskatchewan" without giving any economic data. The author discusses the relationship between migration habits and patterns and grain damage, concluding with a recommendation for the use of various cultural and defensive control methods. Miller and Paul (1942) in a U.S. Department of Agriculture circular discussing farm wildlife from an economic standpoint have a similar 'control' orientation.

2.5. Studies on Attitudes Towards Wildlife

The recognition and understanding of man's attitudes towards wildlife is of fundamental importance in establishing animal depredation and control policy. What motivates man to take control measures

or to encourage a species' increase are his attitudes. "Attitudes are behavioral predispositions which exert an enduring controlling influence over behavior." (Leuba, 1961, p.382) Each attitude consists of a number of persistent or recurrent or related sets, both perceptual or mental and motor, directed toward a particular person or other aspect of the environment. Each perceptual set consists of imagery, and each motor set consists of muscle contractions for an action. Using Leuba's (1961, p.382) definitions an attitude can be schematically shown as follows. (Fig. 5)

The diagram only shows one attitude. Of course man operates with complex groups of attitudes most of the time. A farmer may have one attitude about animals in a depredation context and another attitude in a hunting context.

Very few studies have emphasized man's attitudes towards wildlife. Mech (1966) in his Wolves of Isle Royale (p.2) study mentions the role of folk tales, such as Little Red Riding Hood, in tempering the human attitude towards that species. He believes that these attitudes have resulted in the unwarranted hostility towards wolves. This hostility has resulted in their extirpation from most of their former range. Cameron (1968,p.21) in a popular article has also mentioned the role of mythology and folk tales in attitude formation. He said that hawks and owls, as well as wolves, have been the victims of unreasonable persecution based on mis-information and childhood stories.

Only two investigators (Palmer, 1937; Queal, 1968) have examined attitudes towards wildlife in the agricultural context. Palmer asked 302 New York State farmers whether certain wild animals were

Fig. 5 - AN ATTITUDE MODEL

<u>Past Situations</u>

Involving wildlife (dead or injured stock, trampled grain, sighting of animals on property, hawks eating mice and gophers, killing a trophy specimen).

<u>Plus</u>

<u>The Eliciting Situation</u>

Any situation calling for a response toward the subject of wildlife.

<u>The Attitude</u>

A number of sets; unfavorable predispositions towards wildlife or things related to it. (Staying up all night to chase ducks, readiness to report damage, tendency to oppose wildlife conservation movements, readiness to shoot animals.

<u>Overt Action</u>

Any one of a number of hostile actions towards wildlife.

Based on Leuba: 1961

desirable or undesirable. Regrettably the results were only tabulated and not statistically analysed in terms of farm location, previous damage records, and other variables. The article states (p.4):

> The survey . . . indicates that 288 of these (farmers) consider it desirable to kill woodchucks on their farms. Weasels are considered undesirable by 273; crows, by 217; foxes, by 209; hawks, by 198; skunks, by 159; owls, by 125; and deer, by 40 . . . . 191 recognize a commercial value in having wild animals free and living on their farms; 176 provide cover for wildlife, and 152 feel that if wildlife is taken from the farms the farmer should receive financial return. This survey further shows that 198 of 282 of these men obtained their information from newspapers, 157 from radio, 124 from bulletins, but only 72 from public schools.

The remainder of this article explains the identification of many New York species and their range, habitat, behavior to heat, light, and moisture, and their relation to man's interests. Many of the animals that farmers consider to be undesirable are shown to be actually beneficial, and not deserving of the fate that a misinformed public wishes on them.

The most recent work on farmer attitudes has been Queal's (1967) study in southern Michigan. Queal wished to gather information regarding farmer attitudes towards deer, severity of crop damage, and farmer willingness to allow hunting. This information was needed to make important management decisions.

In 1960 and 1965 a randomly chosen two per cent sample of 123,000 farm owners and operators were polled by postal questionnaires. During the five year study period deer population had increased from 31,000 to 58,000. The buck kill increased from 3,070 to 8,090 and the reported highway kill increased from 1,183 to 3,197. At the same time the number of licensed hunters rose from 40,530 to 93,080.

In 1960 approximately twelve per cent of the farmers had deer damage to crops averaging $55. By 1965, fourteen per cent of the farmers reported crop damage averaging $92. During the five year period the total annual damage (includes damage to crops, fences, vehicles, trees and orchards) costs rose from $400,000 to $800,000.

As crop damage, road kills, and deer population rose farmer attitudes changed. These changes were in the relative numbers of deer wanted on farms and the willingness to permit hunting. In 1960, thirty-six per cent of the farmers permitted hunting and in 1965, fifty-one per cent permitted hunting. The number of hunters in the farm families who hunted on their own land increased from seventeen per cent to twenty-six per cent. The rise in granting of hunting permission was correlated directly with the number of deer the farmer had seen on his farm and the amount of crop damage he had suffered.

The tolerance of hunters was significantly related to population densities. Where densities were high fewer hunters were tolerated and where densities were low more hunters were tolerated. The degree of toleration increased from 1960 to 1965, the period of deer number and damage cost increases. The significance of this study is the demonstration of a link between farmer experience and farmer attitude.

2.6. The Renewable Resources Report

The Province of Alberta for some years has recognized a severe migratory waterfowl depredation problem. As previously mentioned a compensation scheme to combat the problem was inaugurated in 1961. Each year since then heavier demands have been placed upon the compensation fund until in 1969 it was thought no longer possible to have it

operate on a self-sustaining basis (i.e. financed solely by wildlife certificate sales.)

In light of the difficulty of the Wildlife Damage Fund to sustain itself the province decided to commission a complete study of the damage problem and the various solutions. The firm of Renewable Resources Limited was commissioned to make this study (1969). Such a study had never before been done in the province. Damage permits or pre-season shooting permits, the Wildlife Damage Fund, and to a lesser extent, local approaches to depredation problems had never been evaluated in terms of effectiveness or advantages and disadvantages.

Many of these solutions were instituted as 'stop-gap' measures with little thought of long range affects or integration with other approaches. Shooting permits were in some cases actually increasing the areal extent of damage by forcing the ducks and geese to constantly seek new feeding sites when chased by shots from the old. Permits were often abused and issued without necessity. The damage fund more often than not was legally constrained from paying a just compensation for damaged crops. The $15 per acre maximum payment was usually less than the direct planting and harvesting costs assumed by the farmer.

The Renewable Resources study approached the waterfowl depredation problem with two main foci. The first was an analysis of past incidences of depredation. Damage fund payment and shooting permit, both by year and location were plotted on a large scale map of the province. Hypotheses concerning the relationship of depredation to nearness to waterbodies, harvest conditions, and precipitation were made and statistically tested. Ninety per cent of all damage sites

found to be within three miles of a permanent waterbody and sixty per cent within one mile. The location of damage sites with respect to pothole (i.e. non permanent waterbodies, usually field depressions without drainage courses that act as rainfall collection reservoirs) locations were found to be inversely related. Waterfowl actually shun potholes in favor of larger waterbodies perhaps because of greater security found on larger waterbodies when hunting pressure is high.

The degree of vulnerability of a crop is a function of the length of harvest. The birds only cause damage of important economic consequence when the grain is laying swathed on the ground for ripening. The length of time that the grain is lying swathed depends on weather conditions, primarily temperature and moisture. Therefore damage is minimized in the warmer and dryer years when the ripening time is shortest.

The time of harvest is also an important consideration. Should the number of migrating waterfowl peak during a period shortly following most of the swathing damage will be intensified. The coincidence of migratory numbers peaking and crops in the vulnerable swathed condition rarely occurs in the southeastern section of the province but often occurs in the central and northern areas. The harvesting chronology is five to seven weeks retarded in the latter areas.

The susceptibility of different types of grain to depredation varies. Although wheat and barley are damaged almost equally for any given year in terms of acres and bushels, a preference is shown for barley in that its acreage is only about one-half that of wheat. Damage to oats is relatively minor.

The second focus of the study was a questionnaire mailed to a randomly chosen sample of 7,500 Alberta farmers. This sample was chosen from the approximately 69,000 farmers of the province. There were fifteen-hundred replies. Fifty-seven per cent of the farmers reported damage yet only seven per cent had ever claimed for compensation. Two reasons were put forward for the low percentage of claimants; (1) damage was considered by many respondents to be an occupational risk; (2) some farmers did not know a compensation plan existed. By examining the frequency distribution of losses to non-claiming farmers the threshold of tolerance to damage was determined to be about $500.

Shooting was the most frequent control method used (fifty per cent). The second most popular control method was the scarecrow (thirty per cent). Other methods of lesser importance were chasing birds with vehicles and leaving machinery in the fields.

A program of lure cropping (leaving certain fields swathed for feeding) was thought by twenty-seven per cent of the farmers to be the most acceptable solution to the damage problem. Another twenty-seven per cent thought increased compensation most acceptable. All other solutions had fewer proponents.

The average farm size of claimants was larger (948.69 acres) than that of non-claimants (798.02 acres). The larger farms had a greater susceptibility to damage but also were more likely to claim for damage. Socio-economic considerations could be determinants of these facts but were not studied.

The report estimates on the basis of the questionnaire results that in 1968, alone, there were losses caused by waterfowl depredations of about six million dollars.

In addition to the material presented above the report discussed technical aspects of various control methods and the delineation of zones of susceptibility. The essence of these discussions as well as a perspective on the depredation problem are summarized in the major recommendations of the report quoted below.

Recommendations:

> Note: The following are general statements of more detailed discussions and recommendations made in various sections of the report.

1) Recommend that the existing compensation program be modified to eliminate the $15 per acre ceiling of payments, and that payments be based on half the crop value according to current annual commercial values of grain crops.

2) Recommend that financing to enable implementation of #1 and several other recommendations be derived from a $1.00 increase in wildlife certificate fees.

3) Recommend consideration be given to providing optional coverage upon payment of premiums to provide total compensation to farmers who wish additional protection. This could be made available under the existing All Risk Crop Insurance Program in Alberta.

4) Recommend that an experimental damage prevention program be instituted in the Grande Prairie area.

5) Recommend substantial curtailment of the issuance of shooting permits throughout the province and greater controls on those issued.

6) Recommend the publication and dissemination of a bulletin describing the damage problem in Alberta; what individual farmers can do to reduce damage, and information on compensation available for damage sustained. Publicize existing program.

7) Institute a program of purchase of crops in high damage areas to contain damage by maintaining sanctuary for waterfowl on these areas and encouraging scaring on adjacent areas.

8) Recommend phasing of a long term plan for combined damage prevention and compensation programs throughout the province as presented in Section IX of the report.

9) Recommend further research studies to investigate in more detail the following:

   a) Factors influencing damage in specific susceptibility zones.

   b) Data on Waterfowl populations and chronology of migration for specific damage zones.

   c) The locations, numbers and sizes of lure crops and feeding station required for optimum damage prevention.

   d) Cost-benefit analyses between compensation and various methods of damage control i.e. feeding stations, permanent lure crops, purchase lure crops.

CHAPTER III

METHODOLOGY

3.1. The Choice of a Study Area

The choice of a study area was determined by several factors. It was necessary to have an area: with a demonstrated abundance as well as diversity of animal hazards; where good records of past depredations were available; on the fringe of commercial agriculture; and of manageable size. The only area meeting these specifications was the Athabasca Officer District (A.O.D.). In addition to these advantages the A.O.D. offered good access from Edmonton. The officer districts of the Peace River, Grande Prairie) were too large for the intensity of coverage desired and in a third case the district (High Prairie) had a large number of French speaking farmers which would make interviewing difficult. The three districts between the Peace River region and Athabasca (Whitecourt, Valleyview and Barrhead) were eliminated because of their limited involvement with commercial agriculture. To the east of Athabasca are three districts (Lac La Biche, St. Paul, Cold Lake) that were ruled out because of declining agriculture, and, again the problems of interviewing in French.

3.2. The Length of the Study Period

In order to minimize discrepancies in the objective data (i.e. Fish and Wildlife, and Hail Insurance Board Records) and in the memories of respondents a five year study period was chosen. Although all Fish

and Wildlife offices are required to maintain records, the quality and coverage of these has varied over the years. Beaver and duck damage records reaching as far back as the mid-fifties are still extant. This is because most complaints involving these animals are resolved by the issuance of a damage permit (Appendix C) giving the farmer unlimited shooting rights during a specified time period. Also specified on the permit is the quarter-section where the damage has occurred, the nature of the damage, and the number of shooters permitted. Upon the expiration date of the permit the farmer is required to return the permit to the issuing office with an explanation of action taken and results obtained. The A.O.D. office has kept accurate yearly tabulations of damage permits issued and results.

Damage caused by animals other than ducks and beaver is not usually handled by the issuance of a damage permit. In these cases the district wildlife officer will often inspect the damage and discuss possible solutions with the farmer. It is the officer's responsibility to file a memorandum of his inspection, discussion, and recommended action. These records are kept for legal purposes and the evaluation of control efforts. Records of phone conversations involving damage complaints and recommendations are similarly noted and filed. The A.O.D. office has kept reliable records of these cases since 1964.

Respondents' memory spans were also considered in determining the length of the study period. In view of the existence of adequate records for only 5 years and the inability of most respondents to remember details over a longer period, the years 1964-1968 were chosen for study.

3.3. Objective Data Gathering

All A.O.D. office records of animal damage to agricultural properties were examined. Each incident occurring within the study period was noted by quarter-section location, month and year, animal species involved, and any other details available such as damage costs or suggested remedies. Subsequently the files of the provincial Fish and Wildlife headquarters in Edmonton were searched for additional depredation incidents. In some cases these records were able to give supplementary information on damage cases found in the A.O.D. office records. Generally, however, these records were repetitions of material in the A.O.D. records.

Following this search the Wildlife Damage Fund payment records were examined. All cases of damage payments during the study period were noted by quarter-section location, amount of payment, kind of crop damaged, and date of inspection.

From all sources 178 incidents of depredation were recorded. These incidents involved 209 quarter-sections and 124 land owners after all duplication of ownership and quarter-section resulting from multiple complaints were eliminated.

During the period of data collection and tabulation many reconnaissance trips and conversations with A.O.D. farmers were conducted. Several interesting and unexpected trends became apparent during these exploratory efforts. Damage appeared to be more widespread than the records suggested. Many farmers did not, as a rule, report damages to any government agency, no matter how severe. There also seemed to

be very little understanding of the governments interest and role in wildlife damage problems.

To further investigate these suppositions it was decided to interview a sample of 'non-reporting' farmers as well as those reporting damage. Although it was known the absence of certain ownership data (see section on sampling below) would limit statistical comparison of these two sample groups, the information that would be derived would be of value to the study. No previous attitude study has dealt with both of these groups in the context of damage by all wildlife species, although Queal (1966) dealt with 'damage'and 'no damage' groups in his Michigan study of deer damage.

3.4. <u>The Questionnaire</u>

A four part standardized direct questionnaire was used for all interviews (Appendix A). The choice of questions and structure of the questionnaire was governed by several objectives. Primary objectives were the development of information concerning the farmers management of wildlife on his own farm; his like or dislike of particular species; his degree of toleration of depredation; his involvement with government (including insurance plans) on depredation matters; and the details of, and attitudes towards his depredation problems.

A pilot questionnaire with these objectives was designed and tested. After testing some questions were added, others reworded, and the question order was changed. The changes in order were made primarily to facilitate a smoother flowing, sequential interview, and to allow for better placement of verification questions.

Parts I and II of the questionnaire are designed to elicit information on the respondent's activities on and off the farm which are connected with wildlife. Part III deals with the farmer's control methods, his like or dislike of particular species, and his preferences for changes in species or populations of species. Also the farmers preferences for solutions or accomodations to depredation problems are elicited. The questions in these three sections were designed to be answered by all respondents, whether or not they had suffered damage.

Part IA was designed to obtain data on specific depredation incidents. Therefore, it was answered by only some of the respondents. A basic description of the depredation in terms of damage type, causal animal, and cost was elicited, for comparison with the respondent's control efforts and his ideas about reasons for the occurrence of the depredation. Respondents who had suffered damage but had not reported it were asked why they did not report. These questions were used to determine if there was a quantitative or qualitative difference in the damage suffered by the two sample groups.

3.5. The Sample

An IBM 360 computer was programmed to give a print-out by the township and range coordinate system of approximately 22,000 quarter sections in the study area. All quarter sections where reported damage had occurred one or more times during the study period were underlined and consecutively numbered from 1 to 209 (i.e. the total number damaged quarter sections reported). Then using property ownership maps of Athabasca and Thorhild counties and Westlock Municipal District, along

with improvement District ownership list of the 209 quarter-sections was made. From this list all duplications of names were eliminated. One-hundred twenty four farmers now constituted the 'reported' group. A sample of fifty, approximately 40 per cent, farmers was deemed to be representative and adequate for the study. This sample was randomly chosen by computer. To cover the contingencies of farm abandonment and change of farm ownership since the last reported damage 10 additional quarter-sections were drawn at the same time. The home quarters of each farmer owning or operating a damaged quarter were then tabulated.

The 'non-reporting' sample had to be chosen differently because of the difficulties in positively isolating all non-reported quarter-sections within the study area that were in agricultural use. Aerial-photo mosaics (1948) were used to eliminate the most obviously non-agricultural areas from the computer print-out. In the far northern part of the study area complete townships could be eliminated. Following these eliminations 1968 aerial photos with a two inch to one mile scale were used for detailed study in ambiguous areas and to resolve the boundaries of agricultural expansion since 1948. There were 11,675 quarter-sections in agricultural uses that had not been reported as having had damage during the study period. A sample of fifty quarter-sections (plus ten for contingencies) were selected for owner and/or operator interviews.

Although this sample is not statistically comparable with the reported group it should be treated as an interesting supplement to the data derived from the first sample. Statistical comparability

could not be achieved with the second sample because of the impossibility of constructing accurate and complete property ownership lists for the 11,895 non-reported quarters. Property ownership maps are only produced at five to ten year intervals, hence making current ownership data impossible to obtain for such a large area, almost 2974 square miles. Without these data the proportion of owners sampled to the total number of owners cannot be determined.

Because the precise number of census farm owners by enumeration area is not available in the census, a second method had to be used to estimate the proportion of the sample. Given that there are 11,491 quarter-sections on non-reported farms, and that the mean farm size in the non-reported sample is 3.8 quarter-sections,[1] 608 acres (this figure is very similar to the 605.5 acre farm size in Athabasca county). Therefore the sample represents a 1.7 per cent proportion.

In order to test the representativeness of this same a χ^2 test was used with grouped farm size frequency data from Census District 13 (these are the best data available). The results were χ^2 = 4.127 (χ^2 = 4.3 with 6 d.f. at pr = .60). These data suggest that the sample has at least a 60 per cent chance of being representative.

3.6. Interviewing

All interviews were conducted in the respondents home or on his farm property. If the owner and/or operator was not home at the

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[1] Computed on the basis of forty-nine farms so as to exclude a ten section Hutterite colony.

first visit repeated visits were made until the interview could be conducted. No substitutes for the owner and/or operator were accepted. Three respondents resided in Edmonton and were interviewed there. One respondent was interviewed at his home in Westlock. Three interviews had to be conducted with the aid of an interpreter. A 100 per cent response was obtained.

In each sample group one of the contingency quarters had to be used for an owner and/or operator interview. One farmer in the reported group was suffering from a serious illness and was confined to hospital in Edmonton. A farm abandonment necessitated the use of a contingency interview in the non-reported group.

As with any interviewing procedures some respondents showed little interest and willingness to cooperate. Some respondents could not be completely convinced that this study was not a government project. In a very few cases the interviewer was met with hostility. Most respondents, however, were cordial and interested in supplying information. Despite any impediments answers were obtained for all questions.

The respondents in the reported group were asked in section I. A. of the questionnaire only about damage which they suffered on the quarter-section that was drawn in the sample. The non-reported group was asked about damage suffered on all quarter-sections in agricultural use. For each damage incident a separate I.A. form was completed.

CHAPTER IV

THE OCCURRENCE OF WILDLIFE DEPREDATIONS IN THE ATHABASCA OFFICER DISTRICT

This part of the study is a discussion of the results from part I.A. of the questionnaire. Part I.A. deals with specific depredation incidents on the farm. How the respondent reacts in particular to wildlife situations and his feelings towards change are part of the study of attitudes.

4.1. Specific Incidents of Depredation

All of the reported (R) sample had suffered damage, forming the basis for their selection in the study.[1] Although none of the non-reported (N.R.) sample had reported damage to the proper authorities[2] twenty-six of them had actually suffered damage in thirty-three incidents (Fig 6 and 7).

The R. and N.R. sample groups were of different sizes and formed different fractions of the total population. Any statistical analysis of the quantitative data presented below would not, therefore, be valid.

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[1] In addition to the cases reported there were six incidents on drawn quarter sections for which no report had been filed. The total number of incidents in the R. sample is fifty-six.

[2] Six actually had reported damage, but the agencies to which they were reported did not keep records or would not allow records to be searched. The agencies and number of reports were; R.C.M.P. (2); Alberta Forestry (2); agricultural fieldman, Alberta Water Resources and the Rochester Research Center (1 each). Excepting the two complaints to the R.C.M.P., most of the help received was in the form of advice. The R.C.M.P. issued one damage permit of which the Fish and Wildlife Division had no record.

LOCATION OF THE REPORTING SAMPLE

Figure 6

Source: Department of Lands and Forests, Government of Alberta. Field Work 1969

LOCATION OF THE NON-REPORTING SAMPLE

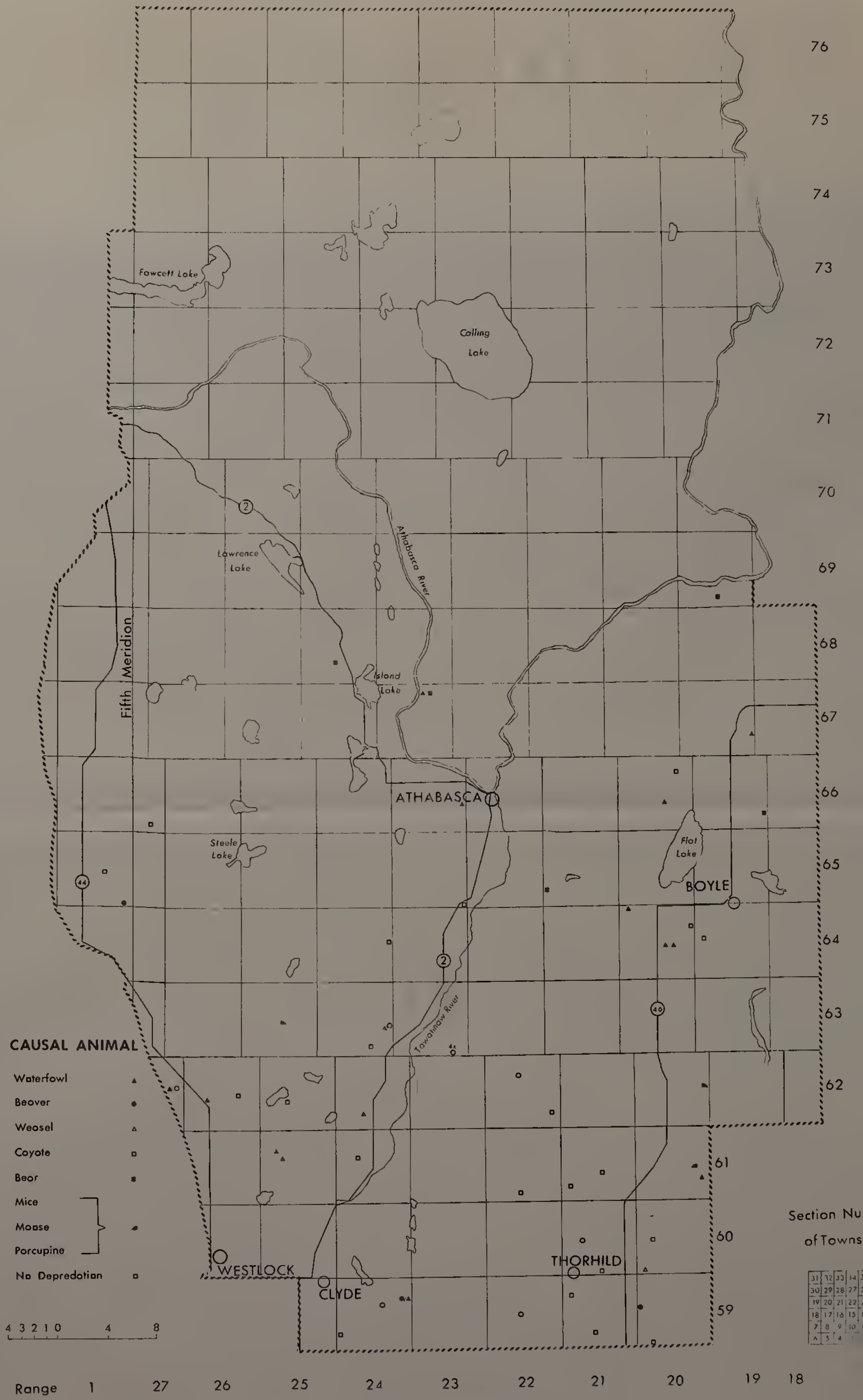


Figure 7

Source Department of Lands and Forests, Government of Alberta Field Work, 1969

4.1.1. Occurrence of Depredation

4.1.1.1. The R. Sample

The annual variation in the number of incidents in the R. sample was very great. Assuming the sample is representative (a 40 per cent sample; N = 124) this variation is not a function of the sample selection system and, therefore, other possible causal factors should be examined (Fig. 8).

The pattern of frequency of depredation by year for species cannot be evaluated, except in the case of ducks, because of the low number of actual cases. The pattern of frequency for duck depredations in the sample, however, follows a trend generally similar to the provincial trend for the same period (Fig. 9). It has been suggested in the Renewable Resources Report (1969, p.50) that depredations increase when the late summer and early fall precipitation is high, resulting in a delayed harvest. This reasoning appears to fit the situation in the Athabasca Officer District (Table VII).

Table VII - August and September Precipitation at Athabasca for the Years 1964 and 1968.

Year	Month	Precipitation (inches)
1964	August	3.52
1968	August	2.78
1964	September	5.00
1968	September	2.89
30 year average August		2.50
30 year average September		1.39

NUMBER OF DEPREDATION INCIDENTS BY YEAR AND ANIMAL-R. SAMPLE

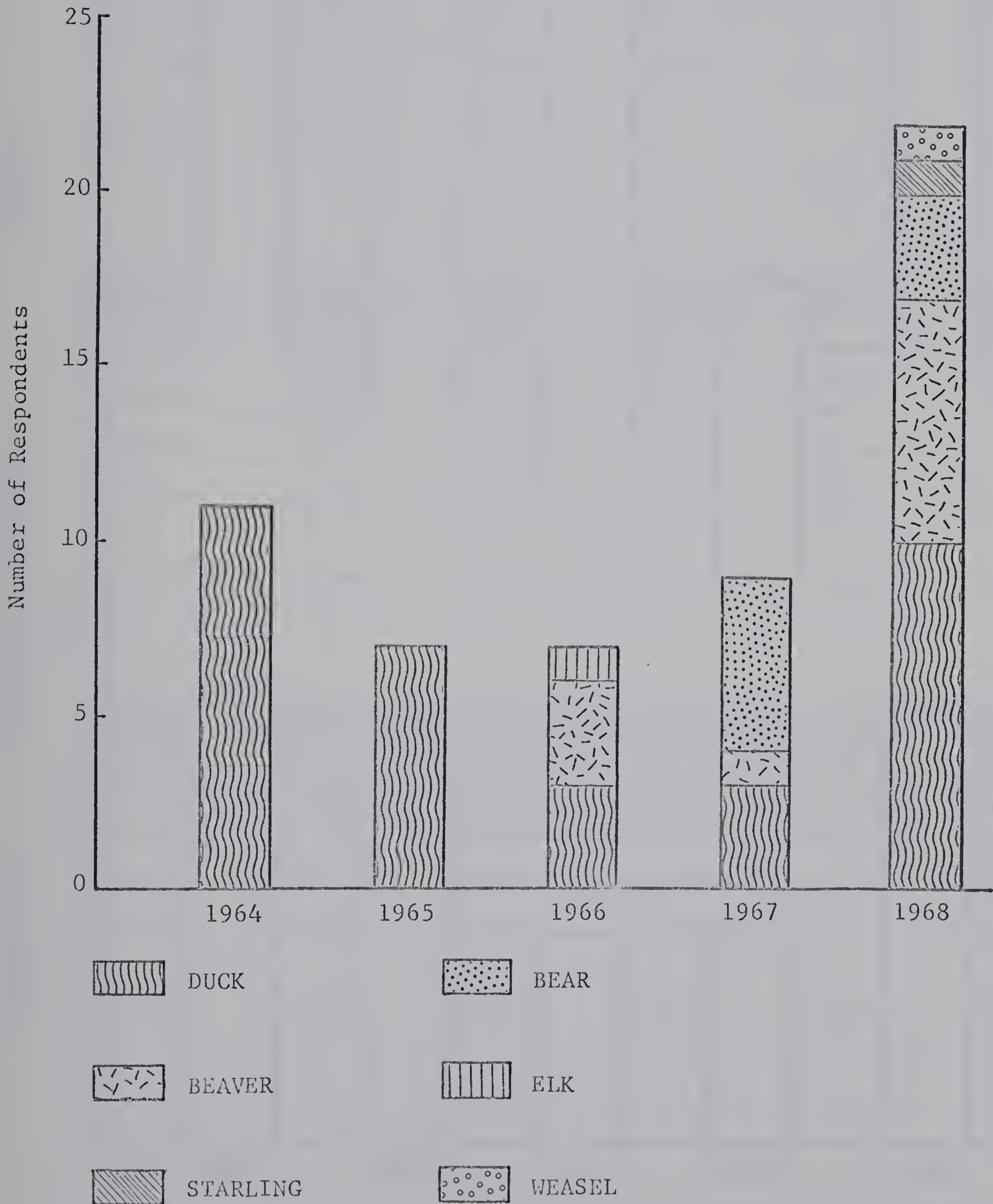


Figure 8

FREQUENCY OF DUCK DEPREDATION BY YEAR IN THE STUDY AREA

(R.SAMPLE) AND THE PROVINCE..

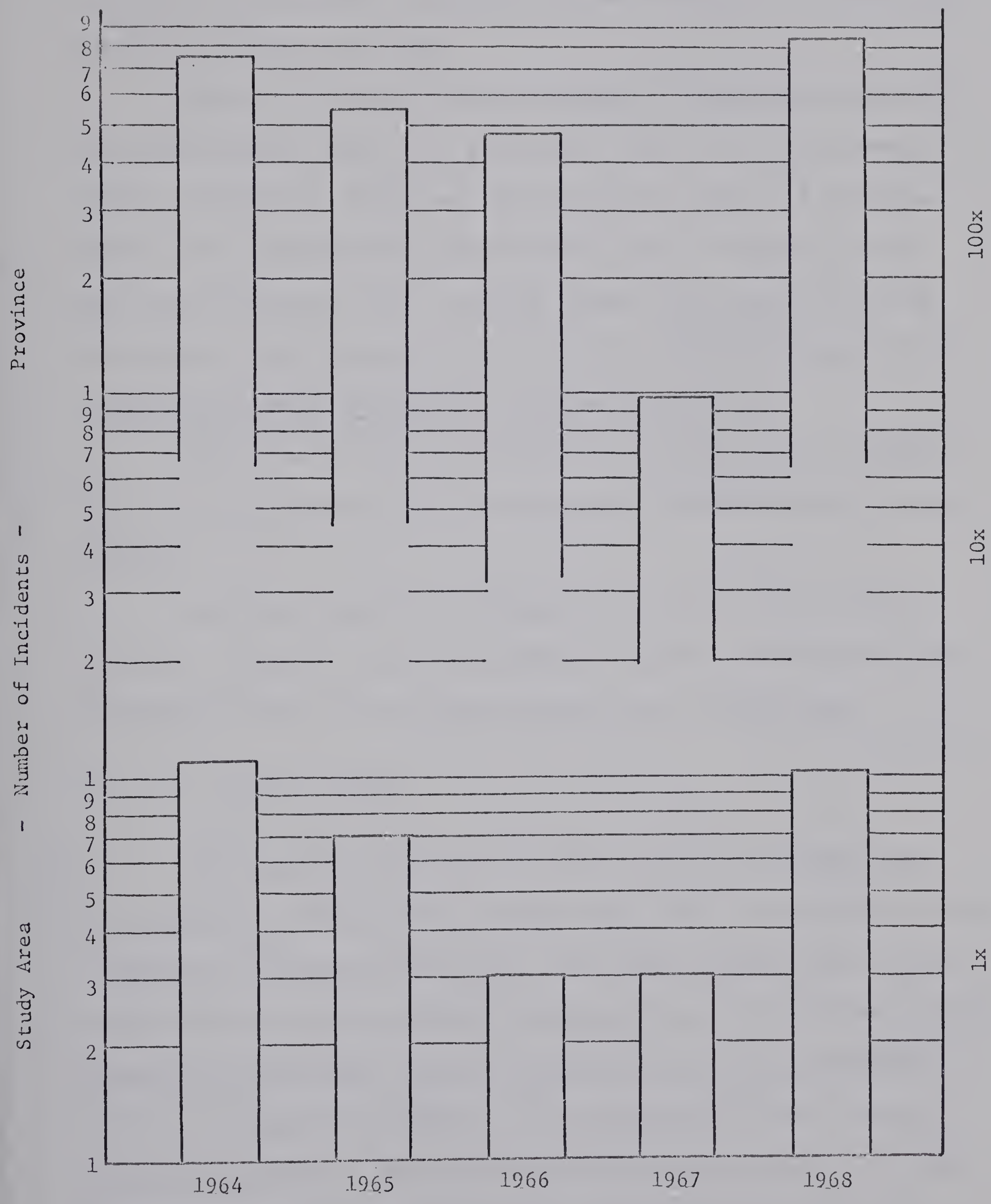


Figure 9

During the months of December, January, February, and April no incidents were reported. In March, June and November one incident per month was recorded (Fig. 10).

Most of the cases of beaver depredation have been classed as continuous because there is no precise and identifiable peak damage period. Flooding of fields and pasture access routes is a continous problem even though dam-building activity usually increases in the late summer and early fall. Flooding becomes most acute at the time of breakup. After the major runoff the size of the pond may decrease slightly but usually not enough to resolve the problem.

The frequency of all depredation shows some seasonal trends, which are only slightly less pronounced when duck depredation is discounted.

No animals caused known damage during the coldest months of the year. During the months of seasonal transition depredations were relatively limited, but the summer months show a decided peak.

4.1.1.2. <u>The N.R. Sample</u>

The number of depredations by year for the N.R. Sample vary even more widely than in the R. sample (Fig. 11). Three reasons may be suggested as explanations for this. The sample was small both in actual size and proportion and its representativeness is therefore suspect. Secondly the interviewer had no information on previous depredations to stir the respondent's memory, as was the case with the R. sample, where the knowledge of past depredation problems was helpful in stimulating the recall of some respondents. Some depredations occurring

NUMBER OF DEPREDATION INCIDENTS BY MONTH- R. SAMPLE

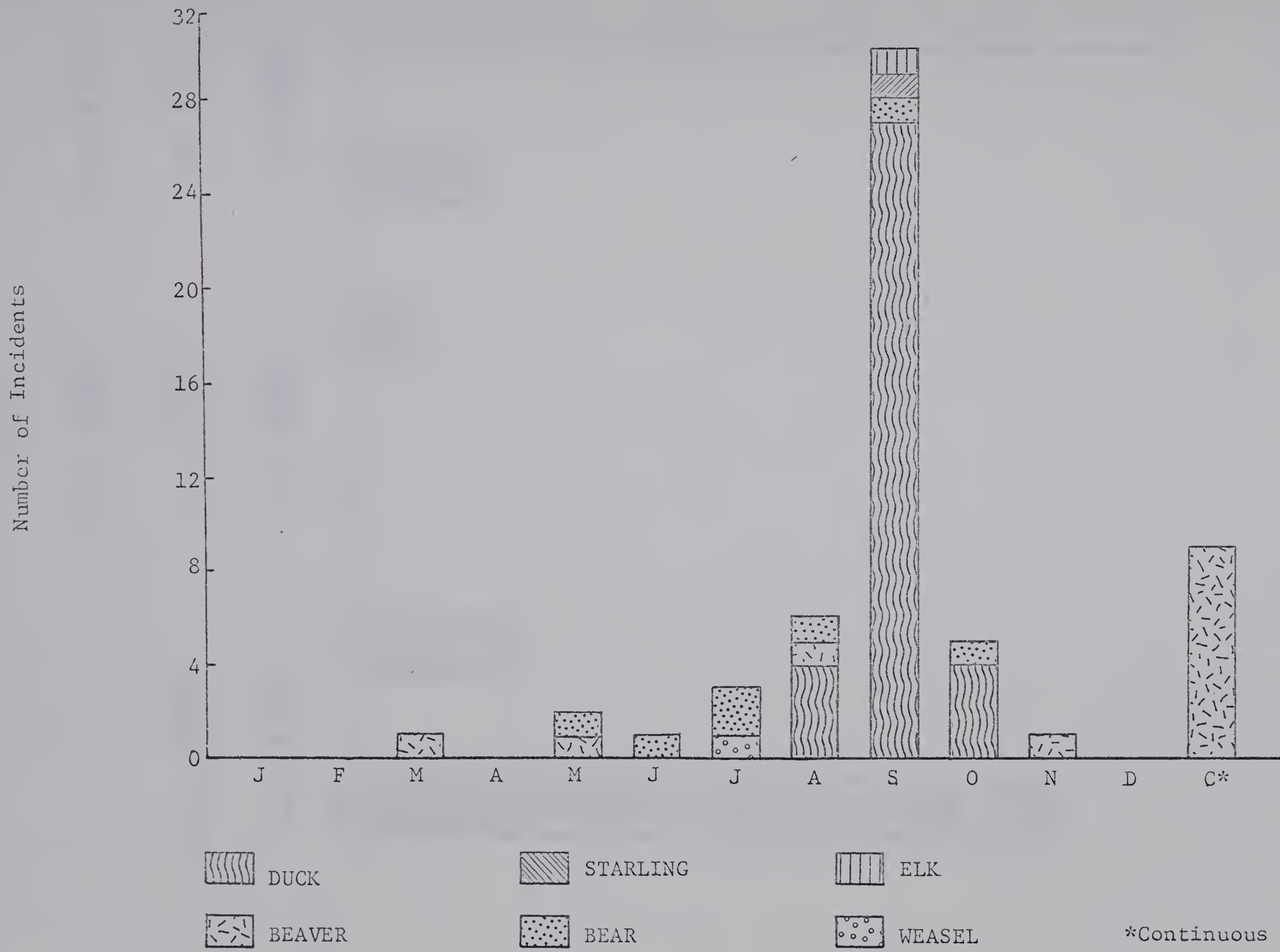


Figure 10

NUMBER OF DEPREDATION INCIDENTS BY YEAR AND ANIMAL-N.R. SAMPLE

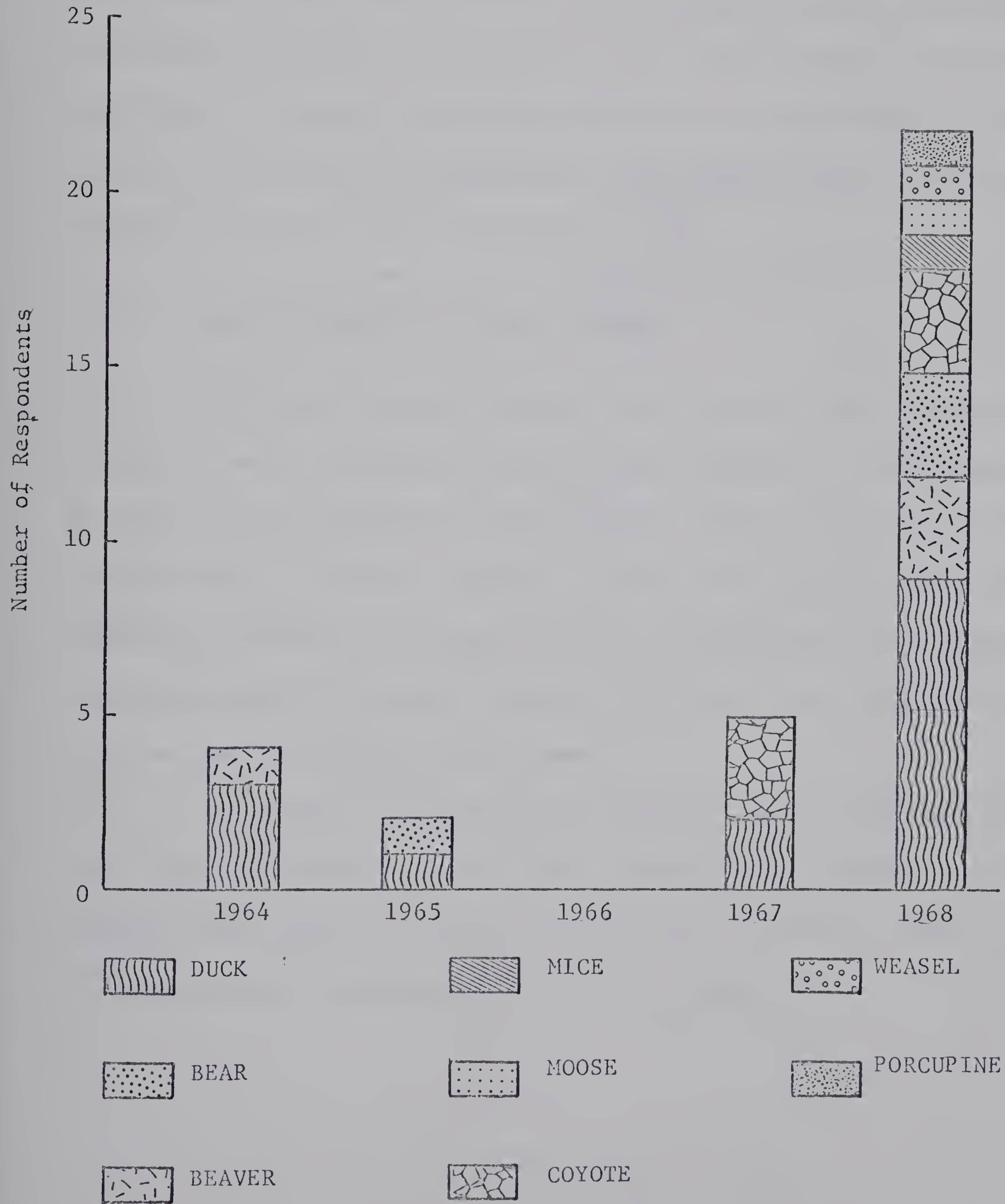


Figure 11

early in the study period may have been forgotten. Both seasonal trends for all animals and duck damage trends generally follow the R. duck damage trend by year.

No depredation occurred during January, February, and March. During April, June, July, November, and December there was only one depredation incident each month (Fig. 12). One incident was considered continuous. Seasonal trends are similar to the other sample. No depredations during the coldest months, low numbers during the months of seasonal transition, and a late summer peak.

4.1.2. Type of Damage and Causal Species

The type of damage suffered in both sample groups varied within species as well as between species (Tables VIIIa,b). Some types of damage were attributable to one animal and some types were attributable to many kinds of animals. Damage to grain was caused by ducks, bears, porcupines, beavers, starlings, and elk. Stock predation of varying types was caused by coyotes, weasels, and bears. Only bears destroyed beehives and only beavers built dams.

The methods of determining the animal that caused the depredation varied (Table IXa, IXb). Bears, weasels, and coyotes were the only animals identified on the basis of tooth and claw marks. Most incidents of longer duration were generally directly observed.

NUMBER OF DEPREDATION INCIDENTS BY MONTH- N.R. SAMPLE

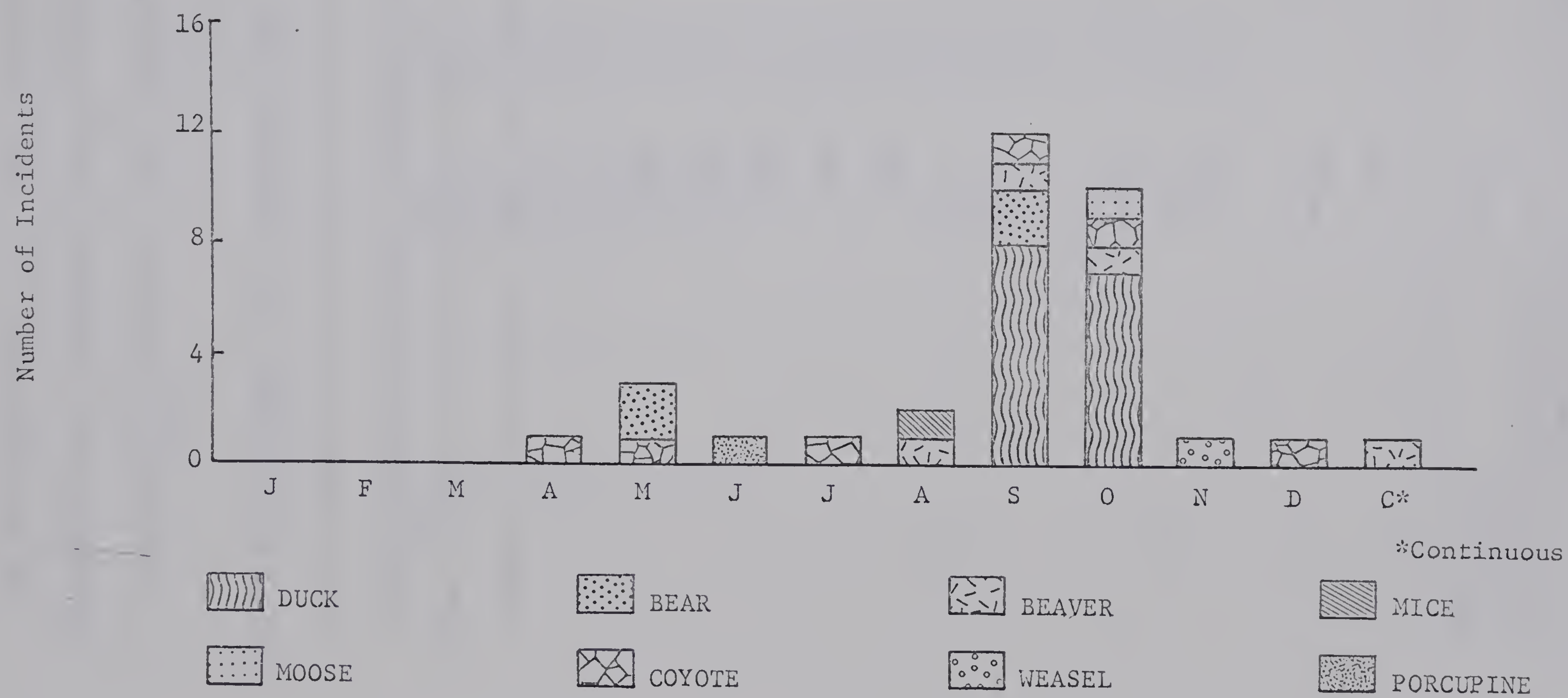


Figure 12

Table VIIIa- Type of Damage by Animal in Reported Sample.

Type of Damage	Animal/s	Number of Occurrences
Beehives disturbed	Bear	2
Dam building and flooding	Beaver	11
Grain damage		
- Trampling	Ducks, 1 bear	24
- Eating of standing crop	Ducks, 1 starling	35
- Eating of swathed or stooked crop	Ducks, 1 elk, 1 bear	34
Steers killed (1)	Bear	1
Steers injured (1)	Bear	1
Sheep killed (8)	Bear	1
Sheep injured (1)	Bear	1
Granaries ripped open	Bear	2

Excepting the fourteen cases where Alberta Wildlife Damage Fund payments were made all costs of damage reported in the R. sample were estimated made by the respondent. The Alberta Wildlife Damage Fund payments were made to thirteen farmers with duck damage and to one with elk damage (Fig. 13). The median loss figure for the R. samples was in the $101-$500 range.

The sixteen incidents for which no estimate was given were, in the case of ducks, comparatively minor, according to the respondents. In the Renewable Resources study (1969, p.75) it was reported that

DAMAGE COST ESTIMATES- R. SAMPLE

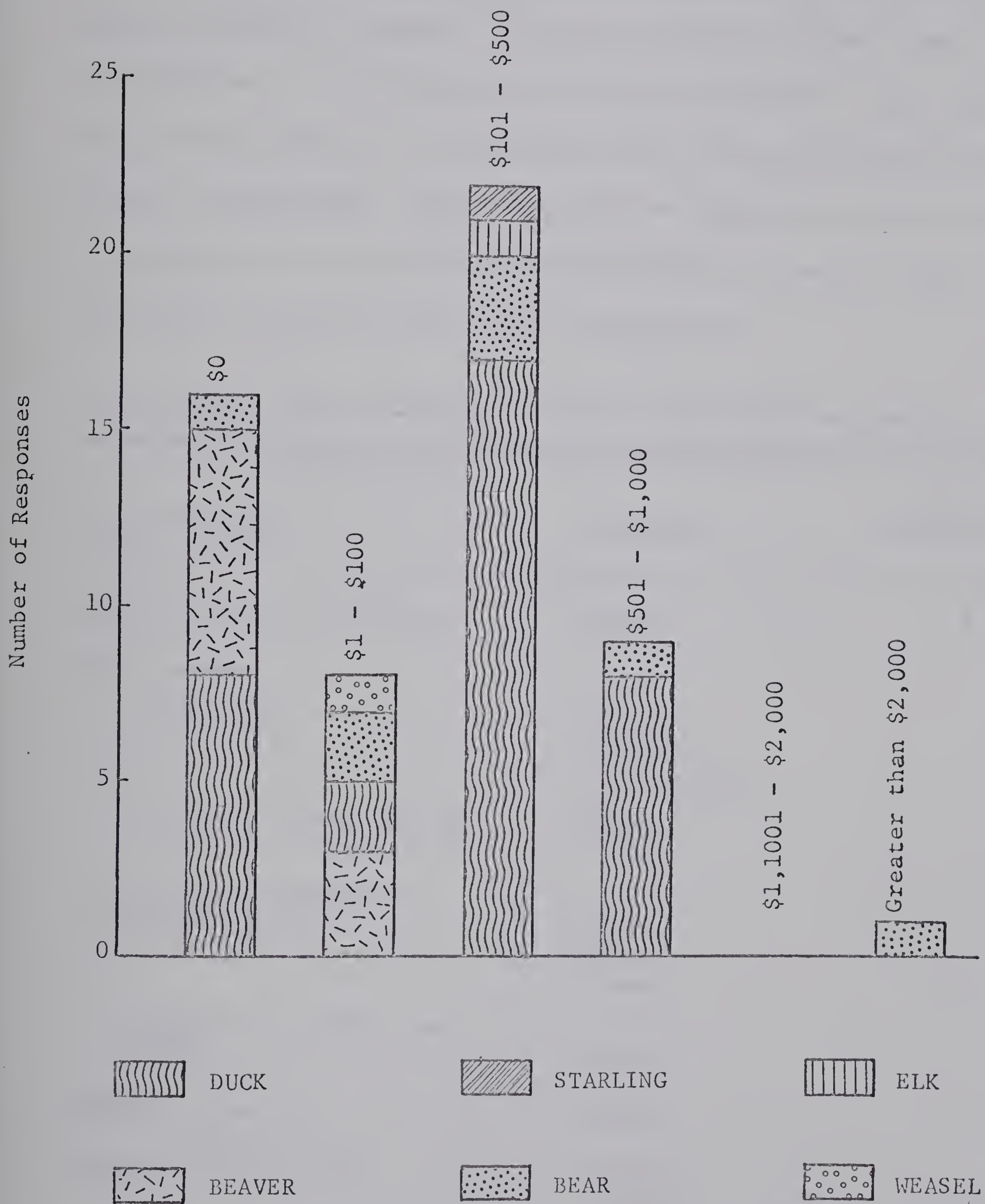


Figure 13

many Alberta farmers were willing to accept up to $500 worth of duck damage without reporting any trouble.

Respondents having beaver problems found it difficult to estimate the extent of damage. Often the flooding limited access to fields and pastures or inhibited certain farming operations (e.g. hay baling). The indirect costs of limited access and time wastage could not be readily established. The direct costs of reparation could not be put in monetary terms because few farmers actually knew what their labour was worth. Material costs were insignificant.

Table VIIIb- Type of Damage by Animal in Non-Reported Sample.

Type of Damage	Animal/s	Number of Occurrences
Dam building and flooding	Beaver	4
Grain damage		
- Trampling	Ducks, 2 bears, 1 porcupine	4
- Eating of standing crop	Ducks, 1 bear	4
- Eating of swathed or stooked crop	Ducks, mice, 1 bear	17
- Removal of stooks from field	Beaver	1
Steers killed (3)	Coyote	3
Poultry killed (183)	Coyotes, 1 weasel	4
Broken fence	Moose	1

Table IXa - Identification of Species Causing Depredation in Reporting Sample.

Animal	Tracks	Claw and Tooth Marks	Direct Observation
Bear	4	2	2
Beaver	-	-	11
Duck	-	-	34
Elk	1	-	-
Starling	-	-	1
Weasel	-	1	-

Table IXb - Identification of Species Causing Depredation in Non-Reporting Sample.

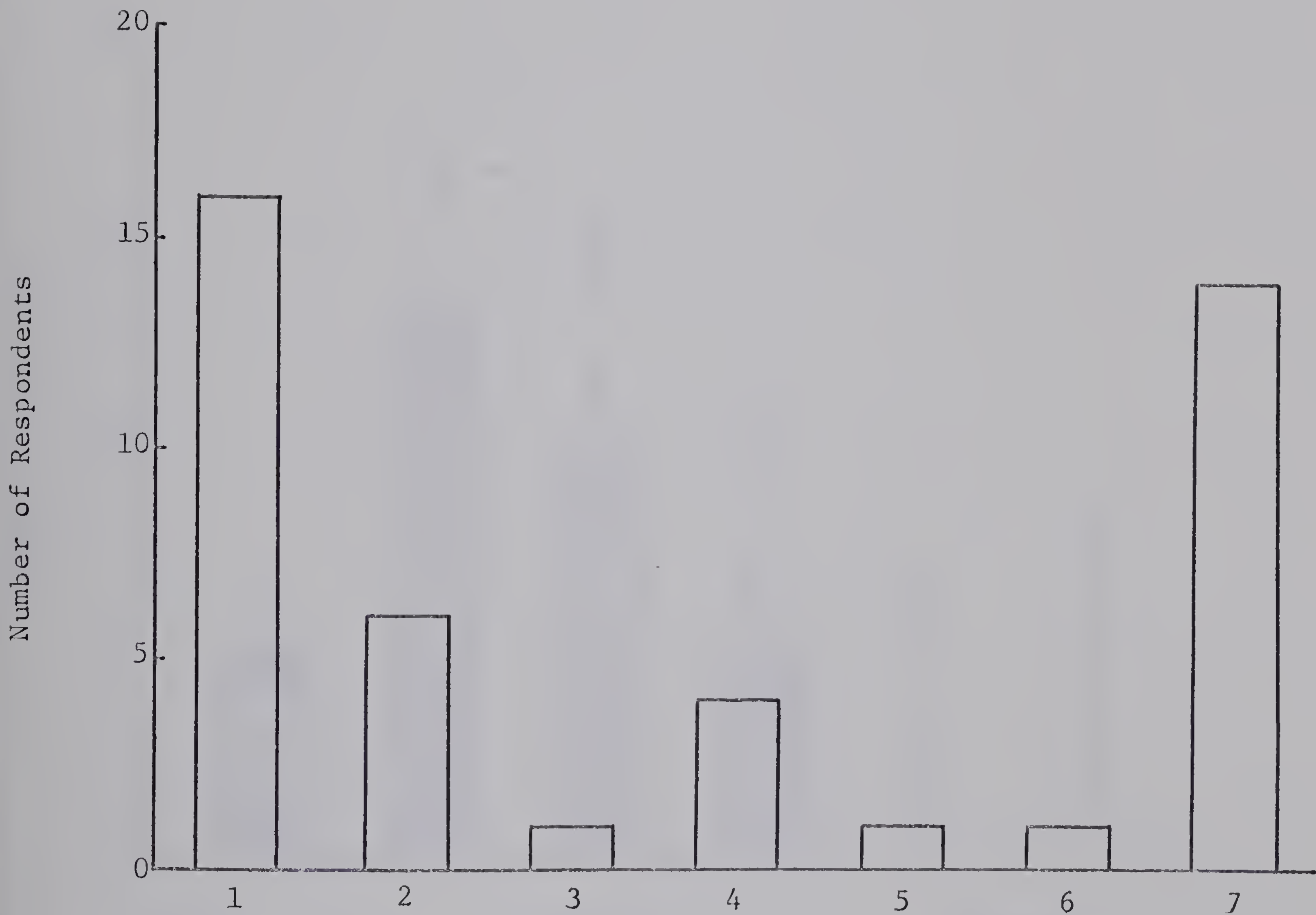
Animal	Tracks	Claw or Tooth Marks	Sound	Direct Observation
Bear	2	1	1	-
Beaver	-	-	-	4
Coyote	1	1	2	2
Duck	-	-	-	15
Mouse	-	-	-	1
Moose	-	-	-	1
Porcupine	-	-	-	1
Weasel	-	-	-	1

The single bear incident lacking an estimated loss figure was similar to many of the beaver problems. The bear destroyed only a few stooks of oats, but in the process knocked many stooks over and spread them around the field. The loss of grain was minimal, although a half-day's labour was required to pick up after the bear. The respondent said he had no way of knowing what his labour was worth.

Those who did estimate a loss used several methods of calculation (Fig. 14). The veracity of these calculations is probably doubtful except where a marketable commodity, other than grain in the field, is lost, or where the costs of materials for repair or replacement alone are concerned. The respondent's estimates of grain losses in the field by any of the listed methods could be inaccurate. It was suggested in the Renewable Resources Study (1969, p.85) that any estimates of loss of grain in the field were liable to be in error. Colorado, which has a compensation scheme utilizing an arbitration board, discovered that farmers often viewed the scheme as a farm subsidy program. Many farmers, in order to compensate for their lack of success caused by poor farming techniques, encouraged wildlife by restricting hunter access, and then claimed damage payments (Denney 1958, p.132).

All N.R. Sample cost estimates were made by the respondents. Five respondents had no monetary loss or could not make an estimate of loss (Fig. 15). Only eight loss estimates (in addition to those where monetary loss was not computed) are based on market value or material replacement and repair. All other estimates are for grain in the field and are consequently not too trustworthy (Fig. 16).

METHOD OF DAMAGE COST ESTIMATION-R. SAMPLE



1 x bushels at y dollars per bushel
2 Yield per acre of similar but undamaged crop
3 Comparison with previous year's yield
4 Estimate of market value of killed stock
5 Cost of hive frames and honey destroyed
6 Expenditure for repair or replacement
7 Alberta Wildlife Damage Fund Payment

Figure 14

DAMAGE COST ESTIMATES-N.R. SAMPLE

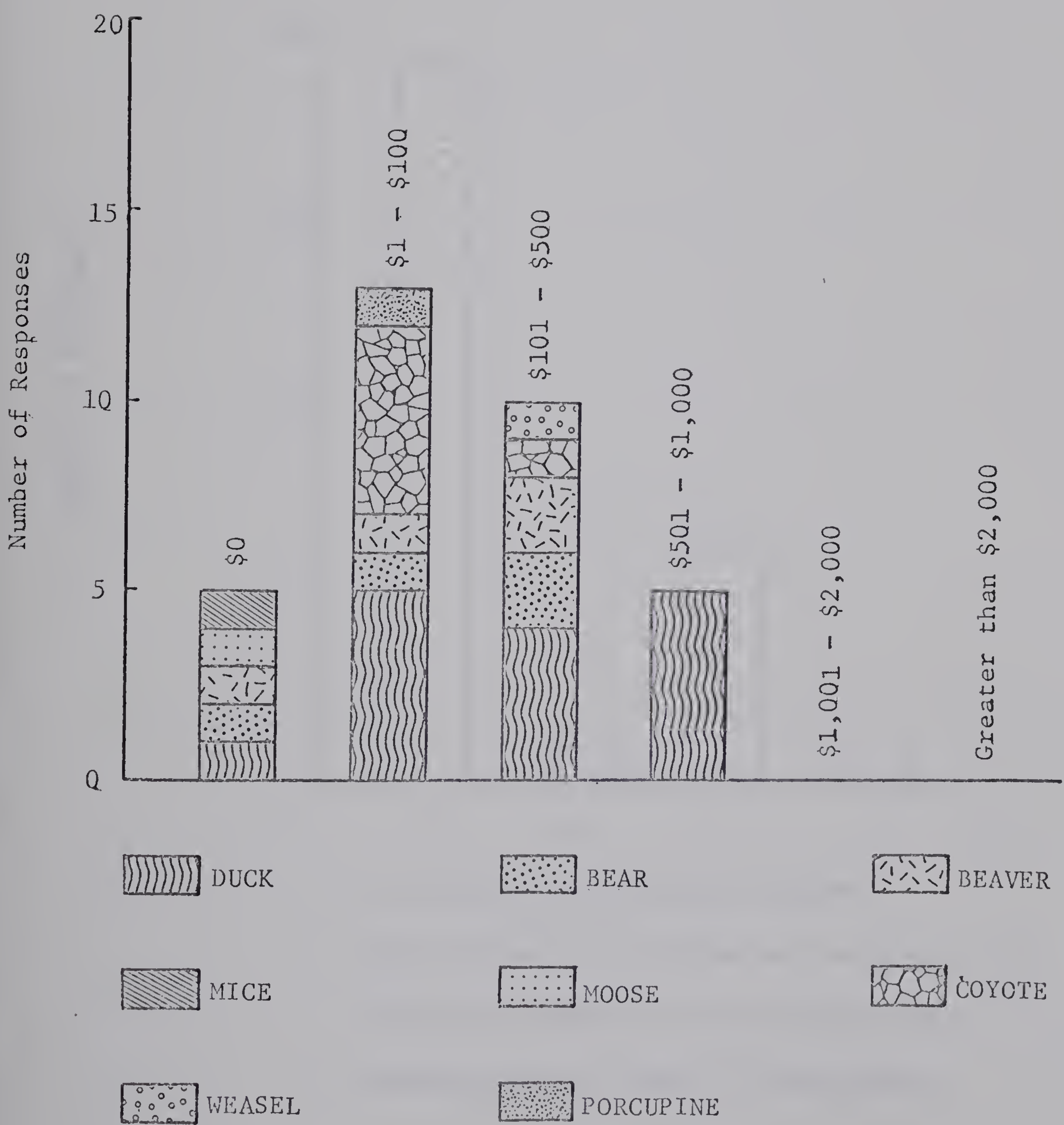
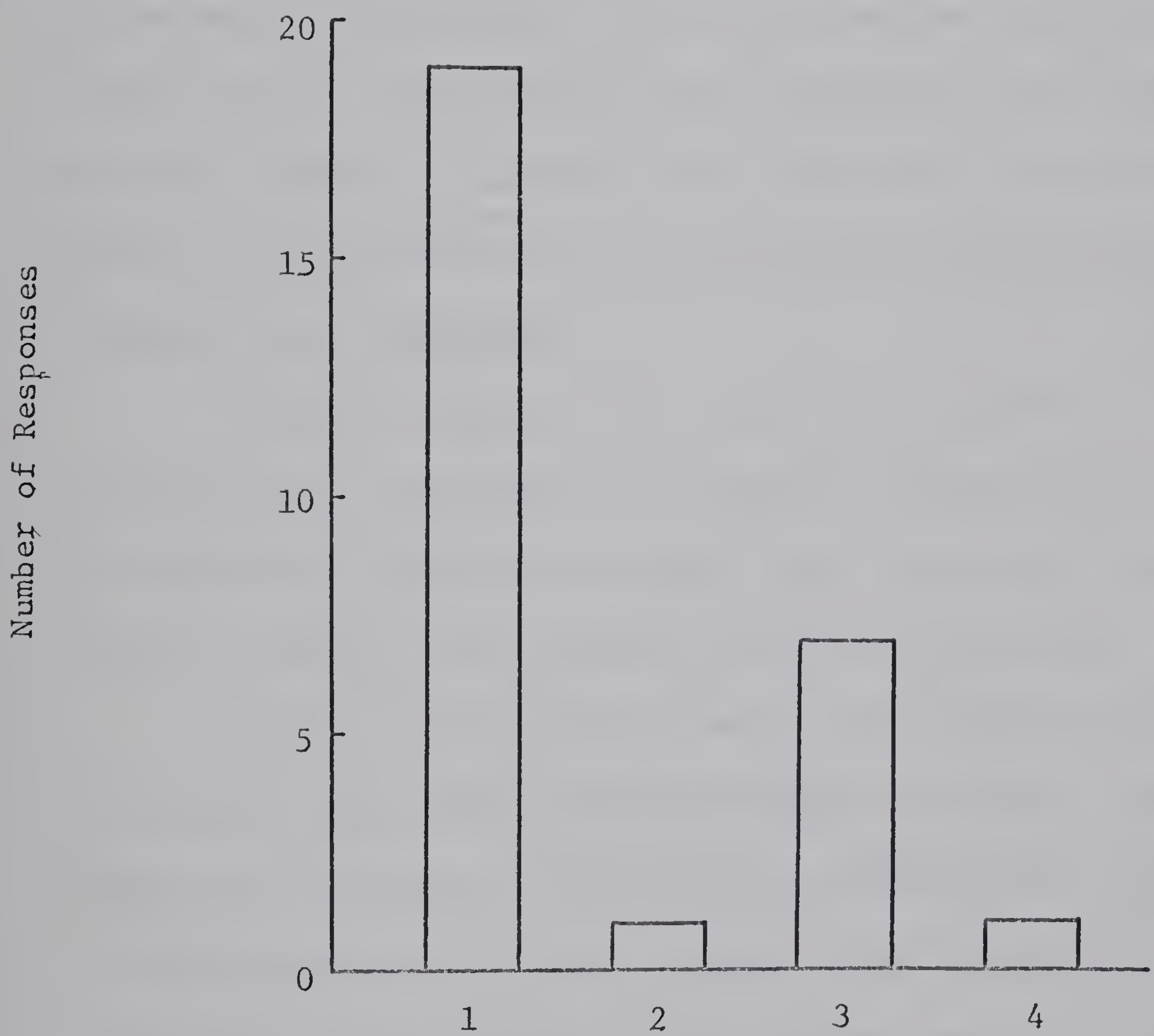


Figure 15

METHOD OF DAMAGE COST ESTIMATION-N.R. SAMPLE



1 x bushels at y dollars per bushel

2 Yield per acre of similar but undamaged crop

3 Estimate of market value of killed stock

4 Expenditures for repair or replacement

Figure 16

The median loss figure for this sample was in the $1-$100 range, noticeably less than the figure for the R. Sample.

The reasons given for the occurrence of damage by both groups are equally diffuse (Table Xa, Xb). In both groups nearness to water was almost unanimously accepted as a reason for duck and beaver damage. Bears' affinity for honey was also listed as a reason in both beehive incidents. No other reasons are as well supported. 'Crops couldn't be harvested before winter' and 'severe weather forced animals to seek food on farms' were thought by many sufferers of duck depredations to be sound reasons. In light of the high rainfall of 1964 and 1968 which delayed the harvest and increased duck depredations these strong responses seem reasonable.

Predation appears to be accepted as a matter of fate by some. In both groups respondents with predator problems gave such answers as 'could have happened to anybody' and 'easy prey or food access' (for the predator) implying that little could be done.

Twenty-two per cent of the R. group and thirty-three per cent of the N.R. group described their damage as chronic. All of these people were resigned to suffering from depredations, and little hope was expressed for any future changes. None had a very positive outlook towards new or untried control methods and most thought the 'government' should be doing more to help them.

Table Xa - Reasons for Damage - R. Sample

Reason	Number Responding and Animal Causing Respondents' Depredations
Nearness to water	32 duck, 11 beaver, 1 starling
Crops couldn't be harvested before winter	1 bear, 2 duck
Severe weather forced animals to seek food on farms	22 ducks, 1 bear
Fields are on a migration flyway	1 duck
Ducks need a feeding field with good vision	1 duck
Easy prey or food access	1 weasel, 2 bear, 1 elk
Nearness to bush	2 bear, 1 elk, 3 beaver
Bear's affinity for honey	2 bear

Table Xb - Reason for Damage - N.R. Sample

Reason	Number Responding and Animals Causing Respondents' Depredation
Nearness to water	1 bear, 9 duck, 4 beaver
Could have happened to anybody	2 bear, 1 coyote, 2 duck, 1 weasel, 1 mouse
Crops couldn't be harvested before winter	2 ducks
Severe weather forced animals to seek food on farms	2 beaver, 9 duck
Fields are on a migration flyway	1 duck
Ducks need a feeding field with good vision	1 duck
Animal escaping while being chased	1 moose
Easy prey on food access	5 coyote, 1 weasel
Nearness to bush	1 porcupine

CHAPTER V

THE ATTITUDES AND BEHAVIOR OF FARMERS TOWARDS WILDLIFE AND WILDLIFE DEPREDATION

The study of attitudes of farmers towards wildlife depredation must include an analysis of farmers' general activities connected with wildlife as well as the handling and analysis of specific wildlife problems on the farm. These connected activities include sporthunting, pest control, membership in organizations, like and dislike of particular species and control of protected species, whether or not involved in depredation.

In this portion of the study both sample groups are directly comparable because sample sizes are equal. All respondents in each group answered parts I, II, and III of the questionnaire. Throughout this discussion statistical significance is affirmed at the ninety-five per cent level.

5.1. Wildlife Insititutions

Each respondent was asked two questions concerning wildlife institutions in the study area: Membership in the local chapter of the Alberta Fish and Game Association and the location of the local provincial Fish and Wildlife Division office.

There was a significant difference between the number in each sample that knew the correct location of the local Fish and Wildlife office. Forty-five of the reporting (R) sample compared with twenty-six of the non-reporting (N.R.) sample knew the correct location. Five

respondents in the N.R. sample did not, despite the fact that they had reported damage problems, know the correct location. Amongst those in the N.R. sample who did know the correct location, five did not report their troubles there. Fourteen of the R. sample gave incorrect locations and ten did not give any location. Figure 17 shows the various avenues of complaint that have been utilized by the R. sample.

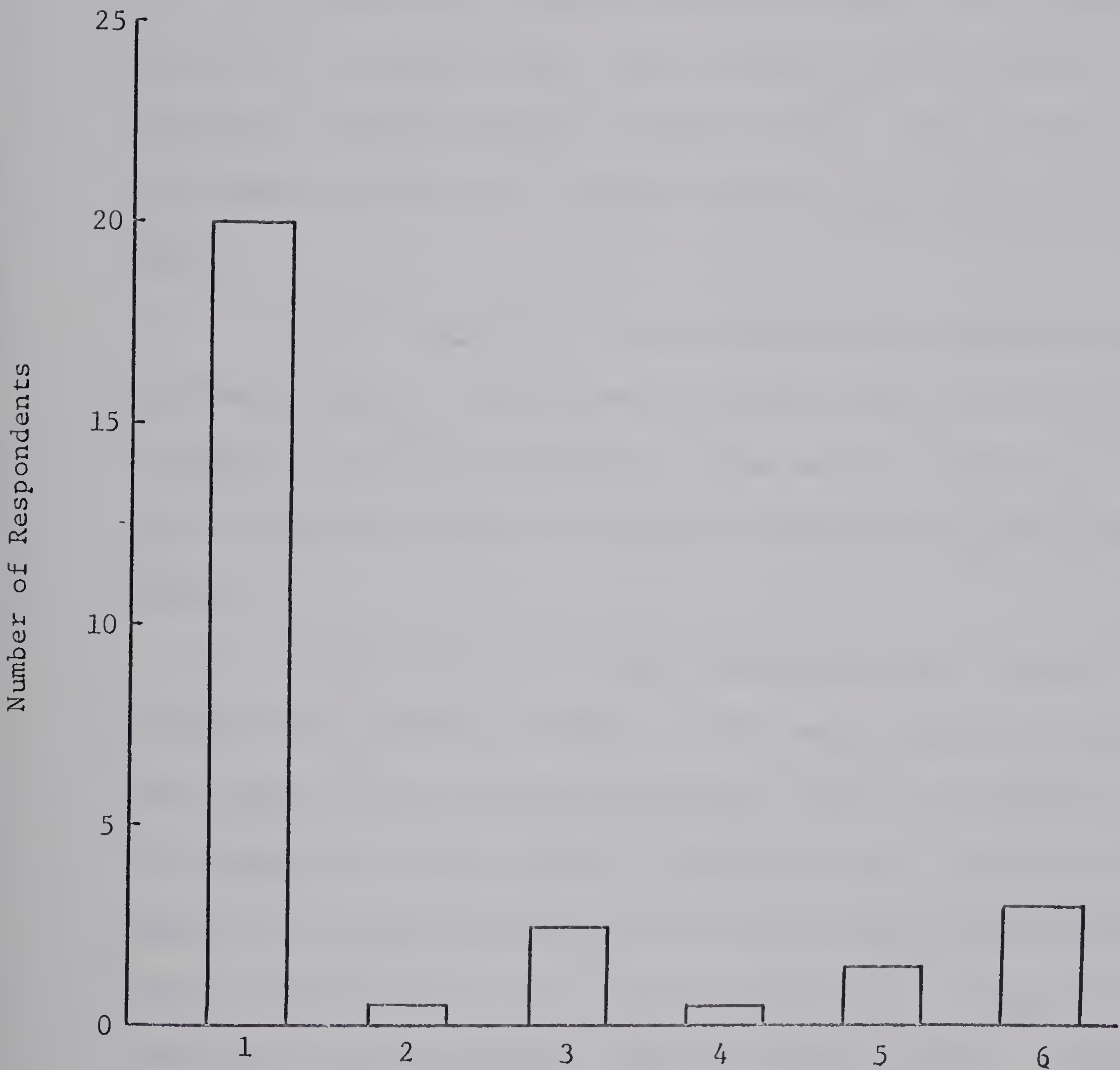
Although there were Alberta Wildlife Damage Fund payments made to N.R. respondents only five first went to their local adjuster. The remaining nine were referred there by individuals and other agencies, not necessarily those of first complaint.

Membership in a local chapter of the Alberta Fish and Game Association also showed a statistically significant disparity between the two sample groups. Eleven (twenty-two per cent) of the R. sample and only four (eight per cent) of the N.R. sample were members.

5.2 Use of Insurance

The voluntary All Risk Crop Insurance which gives slightly more extensive coverage than the Alberta Wildlife Damage Fund was not available in the study area until the 1969 crop year. However, its adoption by individual farmers was noted because it may indicate a willingness to innovate and general progressiveness. In the R. sample eleven farmers subscribed to the insurance. The remaining thirty-nine said that they subscribed to no insurance covering the risks of wildlife damage. In the N.R. sample the insurance was subscribed to by sixteen respondents. The remainder also carried no insurance covering wildlife damage risks. No statistical significance can be attached to these values.

LOCATION OF LODGEMENT OF FIRST COMPLAINT-R. SAMPLE



1 Athabasca Fish and Wildlife Office
2 Local Forestry Station
3 Alberta Wildlife Damage Fund Adjuster
4 District Agriculturalist
5 Local Government (M.D.,County)
6 None*

*This represents unreported depredation cases that occured

Figure 17

Twenty-five per cent (eight) of the R. respondents who had damage of the types covered by the All Risk Crop Insurance subscribed to it. Only six per cent of the N. R. sample with eligible damage were subscribers. The Wildlife Damage Fund was generally under utilized. In the R. sample only fourteen (fifty per cent) of the twenty-eight eligible for payments sought them (eligibility as defined in the regulations and a damage estimate of $100 or more). None of the ten N. R. respondents eligible for Alberta Wildlife Damage Fund payments sought them.

Several respondents in both samples mentioned that damages were an inherent part of farming and, therefore, they did not feel the effort of making a claim was worthwhile. Some were reluctant to call the adjuster because of the $25 inspection fee for each quarter-section inspected.

In the R. sample the mean loss estimate per incident to the eligible non-claimants is $458. If the mean Alberta Wildlife Damage Fund payment to the claiming respondents $365 is adjusted to reflect true commercial values (the full market value of lost production as opposed to the maximum payment of $15 dollars per acre paid by the Wildlife Damage Fund) a loss figure of $1059 per claimant is obtained (Renewable Resources Report, p.82). Therefore, within the sample there was an estimated loss figure of $21,238 in Alberta Wildlife Damage Fund eligible payments during the study period or approximately $4,247 per year. In the N.R. sample the mean value for the ten Alberta Wildlife Damage Fund eligible incidents was $519. The mean cost of damage per year for the study period was approximately $1,050.

Within the R. group only three All Risk subscribers had ever received Wildlife Damage Fund payments. Of course none of the sixteen subscribers in the N.R. group have received payment.

5.3. Use of Control Methods

There are two basic types of control action on the farm. They are general 'pest' (pests are defined here as legally unprotected animals)[1] control and control of other species, which are often protected. Pest control is usually done by the farmer and the control of other species may be done by the farmer or, in some cases by sport hunters.

5.3.1. Pest Control

In both samples a greater proportion hunted, trapped or poisoned pests on their own land than did not. Amongst the thirty-three (sixty-six per cent) of the R. sample who took action, twenty-five sought gophers, eight sought magpies, fourteen sought coyotes, four sought squirrels and one sought porcupines. Pest hunting among the thirty-five (seventy per cent) N.R. sample respondents was divided as follows: twenty-seven sought gophers, twelve sought magpies, twelve sought coyotes, two sought squirrels and one sought moles (pocket gophers). All of these animals may be pursued at the discretion of the farmer. Only two were cited in specific depredation problems, one N.R. respondent having had

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[1]This word is used only in the sense of the definition given. It is not within the scope of this paper to debate the soundness or unsoundness of its connotations or denotations.

an incident involving porcupines and three having had incidents involving coyotes. No R. respondents had problems involving these animals. Although skunks have been troublesome on farms in some parts of the province (Schmitke n.d., p.1) no respondents in either sample attempted any control measures or pursued them.

5.3.2. Control of Other Species by the Farmer

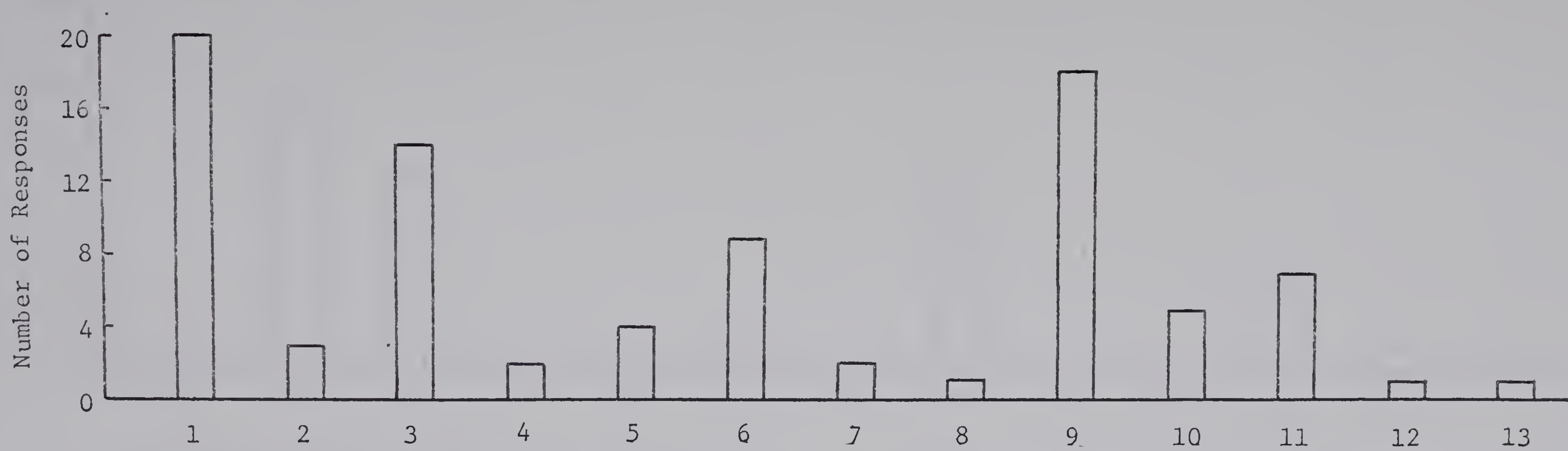
In the case of the R. sample the control of animals that have caused depredations have all been protected species, (i.e. fur-bearers or game) with the exception of the starling. The method of control, of course, varies with species and circumstance (Fig. 18). Five respondents in this sample used no control method.

The N.R. sample involved damage by both protected and non-protected species and therefore some respondents had more latitude in choosing their control method (Fig. 19). Of the twenty-one in this sample who used no control fifteen had suffered no depredations.

Only in two circumstances is the shooting of protected animals out-of-season for control purposes permitted. Damage permits may be issued to allow unlimited duck shooting during a specified time period (usually from the date of application to the first day of the regular season) before the regular hunting season begins in early September. Twenty of the R. sample respondents obtained these permits at least once, which allowed them, and any other individuals specified on the permit, to shoot ducks which were damaging their property.

Bears, also protected, may be shot if they are implicated in depredations. However, in this case a damage permit is not required,

CONTROL METHOD AND OBJECT ANIMAL- R. SAMPLE



1 Shooting to kill ducks - aggressive

2 Shooting to kill bears - aggressive

3 Shooting to scare ducks - defensive

4 Acetylene exploders to scare ducks - defensive

5 Leaving machinery in field to scare ducks - defensive

6 Blasting of beaver dams - defensive

7 Dogs to scare ducks - defensive

8 Dogs to scare bear - defensive

9 Scarecrows to scare ducks - defensive

10 Chasing ducks with vehicles - defensive

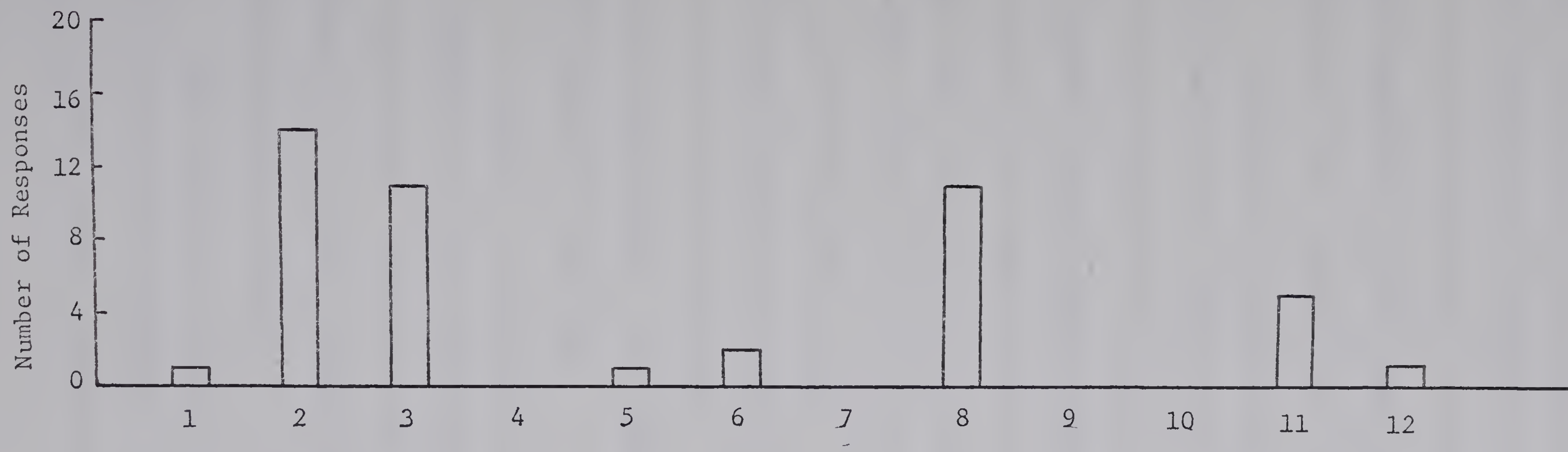
11 Trapping of beaver - defensive

12 Use of guard animal to discourage bear attacks - defensive

13 Poisoning of starlings - aggressive

Figure 18

CONTROL METHOD AND OBJECT ANIMAL- N.R. SAMPLE



1 Shooting to kill ducks - aggressive

2 Shooting to scare ducks - defensive

3 Shooting to kill or scare other animals - aggressive

4 Acetylene exploders to scare ducks - defensive

5 Leaving machinery in field to scare ducks - defensive

6 Blasting of beaver dams - aggressive

7 Dogs to scare wildlife - defensive

8 Scarecrows to scare ducks - defensive

9 Chasing ducks with vehicles - defensive

10 Poisoning - aggressive

11 Trapping of beavers - aggressive

12 Elimination of cereals near lake - cultural

Figure 19

and any aggressive control methods involving shooting may be classed as sport hunting under the regulations of the Game Act. In designated areas (including all of the study area) where bears are a problem, a land owner may shoot a bear at any time of year on his own property. Three respondents in the R. sample and two in the N.R. sample had availed themselves of this regulation for control purposes.

Trapping of protected animals (i.e., beaver) was carried out on seven farms in the R. sample and two farms in the N.R. sample where damage permits were issued for the purpose, or there was a registered trapline. Since beaver trapping requires special skills the actual trapper was sometimes not the farmer, but an experienced trapper designated by him or the local Fish and Wildlife officer. Where trapping has failed to alleviate a beaver problem the local officer may enlist the aid of a Fish and Wildlife blasting expert to blow up the dam. If this person is too busy in another area the farmer may occasionally be given a damage permit to do the blasting himself. Nine respondents of the R. sample reported using blasting. Two respondents (only one under permit) in the N.R.sample used blasting.

A trapline is a designated and registered trapping area where the licensee is the only person permitted to trap, and who must trap on a regular basis. Only one person, from the R. sample, reported a trapline, part of which included beaver dams which were causing damage to the respondent's property.

Sport hunting by the public and the farmers on farm properties may also have a control function. Forty-one of the R. sample said that they allowed the public to hunt on their property, while only twenty-

six of the N.R. respondents permitted hunting. This is a statistically significant difference. Thirteen of the R. sample and eight of the N.R. sample specified that permission to hunt first be asked.

In the R. sample only twenty-three engaged in sport hunting. Twenty-two of the N.R. sample were sport hunters. Among the twenty-three sample hunters ten shot upland birds, seventeen shot waterfowl, and sixteen shot big game. The N.R. sample had a slightly different distribution; sixteen shot upland birds, nine shot waterfowl and twelve shot big game. Approximately forty-three per cent of those in the R. group who had suffered duck damage hunted ducks. Thirty-six per cent of those who had suffered big game damage hunted big game. In the N.R. sample two of those who suffered big game depredations went sport hunting for big game. Only two out of the nine with duck damage hunted ducks.

Those who sport hunted and those who shot pests did not form inclusive or exclusive groups in either sample. (Table XI).

Many control methods were tried by both groups, but with one exception (planting a non-palatable crop near a duck inhabited lake, a cultural method) they were only of two types, aggressive and defensive. Although cultural methods are not difficult for an individual farmer to use, they require him to abandon traditional farming practices. The reluctance to abandon tradition may be a result of poor education and information dissemination from government agencies involved with wildlife depredations. Farmers should be encouraged to plant crops other than cereals in locations prone to duck damage. At present little is done to encourage change in this direction.

Table XI - Cross Tabulation of Farm Pest Control and Sport Hunting

	Farm Pest Control		No Farm Pest Control		
	Number	Per Cent	Number	Per Cent	Sample
Sport Hunting	16	32	7	14	R.
No Sport Hunting	17	34	10	20	R.
Sport Hunting	15	30	7	14	N.R.
No Sport Hunting	20	40	8	16	N.R.

Preventative measures are probably the most effective in the long run but as yet have not been instituted in the study area. These measures generally require large amounts of money and land as well as professional administration. The government, local or provincial, is the only body able to institute and operate preventative schemes. A system of lure cropping for duck damage prevention was recommended in the Renewable Resources Report (1969, p. 148). Farmers in areas of extensive duck damage would be paid to leave certain fields in crop for duck feeding.

Both preventative and cultural control methods appear to have little application to problems of big game and beaver depredations. Here the only solution appears to be a policy of compensation and government-farmer cooperation if these species are to be preserved in the area. The continued preservation of these animals is jeopardized unless new settlement is stopped and present management is intensified. Further clearing and drainage will result in increased damage for a short period and then the extirpation of the animals as a reaction to that damage. This presupposes that at present a man-managed ecological balance between farming and wildlife is possible.

The control methods currently in use are a function of government policy and regulations. None appear to be constructive, positive demonstrations of farmer or government innovations, but instead are simple expediencies to deal with complex problems. An example of these expediencies are the damage permit and the relaxation of regulations on bear shooting. These measures are little more than public relations gestures in terms of effective damage suppression and give the farmer

license to do what is illegal for others. Duck populations probably do not suffer too severely at the hands of damage permit holders, however bear populations could be completely extirpated under present game regulations.

5.4. Suggested Solutions to the Problem

In both samples proposed solutions to depredation problems were quite varied. No one solution had more than a twenty per cent affirmative response in either sample (Table XIIa and XIIb). The strongest relationship between a solution and a problem was in connection with beaver and flooding in the R. sample. Sixty-four per cent of those who had suffered beaver depredations thought that population reduction would ameliorate the problem. Many farmers expressed frustration and hopelessness about the possibility of any solution having much effect. This may explain some of the variation in the responses.

5.5. Perception of Troublesome Animals, and Expressed Desires for Management of Wildlife Populations

Each respondent was asked four questions concerning most and least troublesome animals, preferences for reduction and/or elimination of animals, and the introduction and/or increase of animals.

The number of species contained in the most troublesome list of the R. sample is smaller, only four, than all other ranks for that sample. The animals ranked by individuals in this sample as most troublesome usually were those which had caused the reported depredations (Fig. 20). Only in one case was an animal ranked most troublesome (Squirrel) when it was not responsible for depredations.

MOST TROUBLESOME ANIMAL-R. SAMPLE

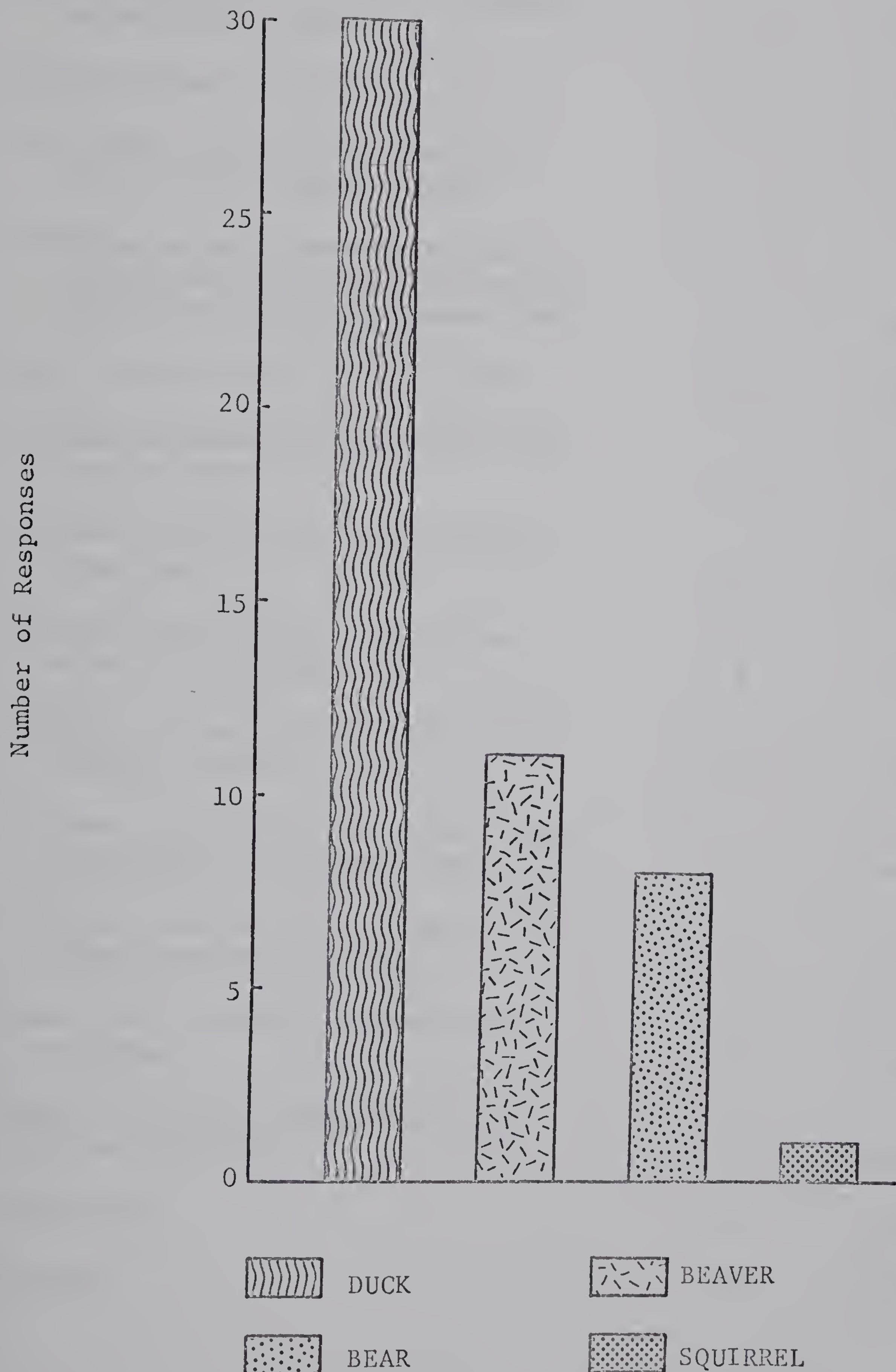


Figure 20

TABLE XIIa - PROPOSED SOLUTIONS TO DEPREDATION PROBLEMS R. SAMPLE

Solution	Number of Respondents	Animal Causing Depredation
Increase compensation	8	6 ducks, 1 bear, 1 elk
Government should establish feeding areas (lure crops)	4	3 ducks, 1 weasel
Reduce animal populations	10	3 ducks, 7 beavers
Give farmer more discretion to control troublesome animals	2	starling, beaver
Increase hunters' assessments and assess hunters' organizations for the Alberta Wildlife Damage fund	1	duck
Earlier and longer hunting season	2	beaver, duck
Increase compensation and establish feeding areas	4	3 ducks, 1 bear
Increase compensation and hunters' assessment	1	duck
Increase compensation and reduce animal populations	3	2 duck, 1 bear
Increase compensation and reinstate a bounty system	1	duck
Increase compensation and reduce tax assessments on flooded land	1	beaver
Increase compensation and earlier or longer hunting season	1	duck
Widen Alberta Wildlife damage fund coverage	2	bears
Establish feeding areas and reduce animal population	2	ducks
No opinions	5	4 ducks, 1 beaver
Nothing	3	2 ducks, 1 beaver

TABLE XIIb - PROPOSED SOLUTIONS TO DEPREDATION PROBLEMS N.R. SAMPLE

Solution	Number of Respondents	Animal Causing Depredation*
Increase compensation	7	3 ducks, 1 coyote
Government should establish feeding areas (lure crops)	5	3 ducks, 1 beaver
Reduce animal populations	5	1 duck, 1 beaver, 2 coyote, 1 bear, 1 moose, 1 Sharptailed grouse
Reinstate a bounty system	1	
Give farmer more discretion to control troublesome animals	2	1 duck, 1 bear
Better Fish and Wildlife control of troublesome animals	1	bear
Earlier and longer hunting season	1	bear
Increase compensation and establish feeding areas	2	1 duck, 1 beaver
Increase compensation and hunters' assessments	1	duck
Increase compensation and reduce animal populations	1	duck
Compensate farmers who have sloughs on their property	1	
Reduce animal populations and establish feeding areas	1	duck
Make burrow building machines for gopher poisoning available	1	
No opinion	3	
Nothing	18	3 ducks, 1 beaver, 1 coyote, 1 bear, 1 porcupine, 1 weasel, 1 mice

*Includes respondents without damages and with more than one damage incident.

The most troublesome rank in the N.R. sample is more varied (Fig. 21). Three animals not involved in depredations, gophers, magpies, and moles have been listed, while two animals, weasel and moose, involved in depredations were not listed. This sample does not have fewer animals in the most troublesome rank than in some of the other ranks.

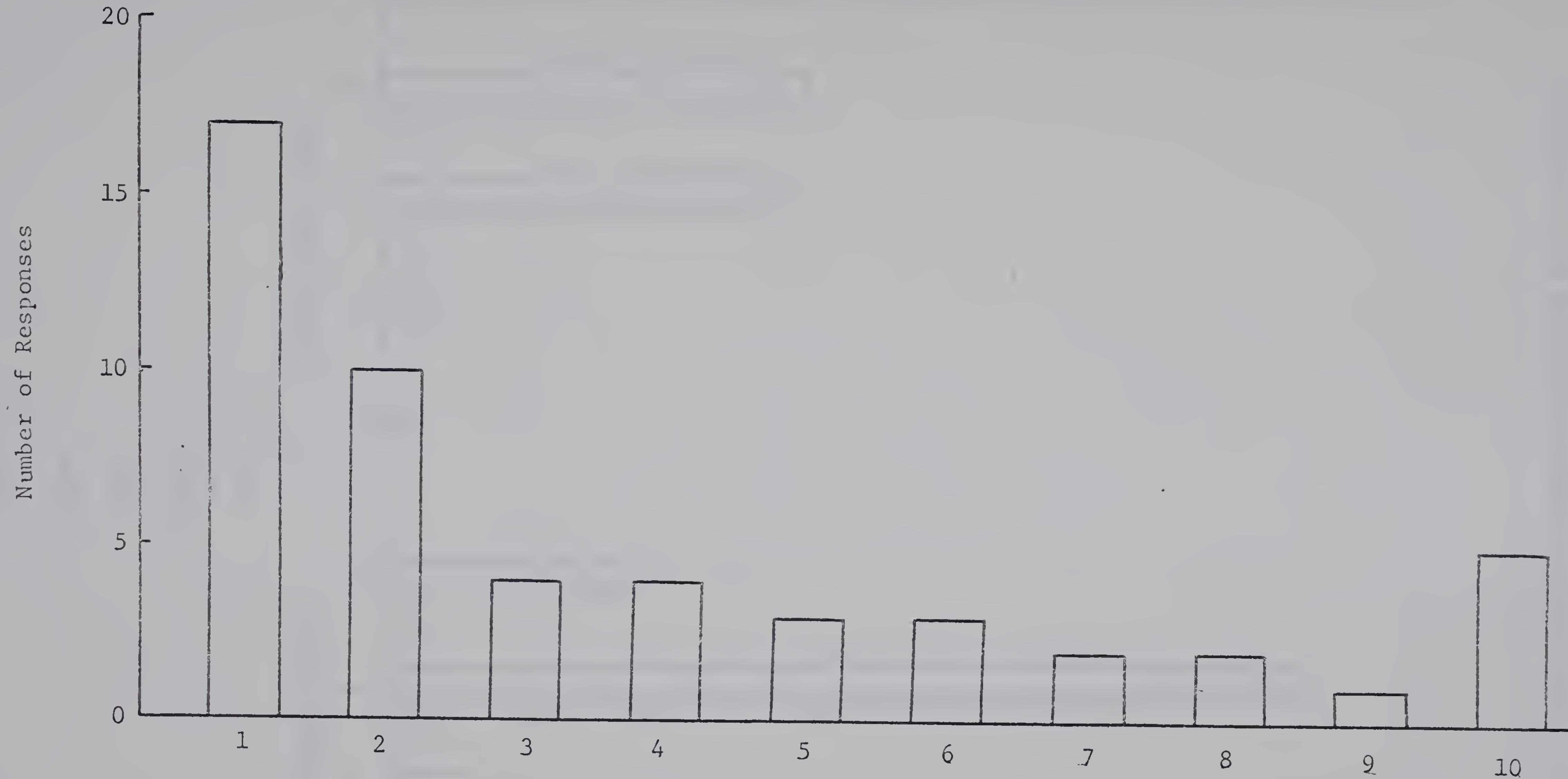
The naming of the least troublesome animals in a similar ranking system (Appendix E) proved to be an exercise in elimination for most respondents. After having named the most troublesome animals the respondent usually just tried to name any animals not previously named, even though they were rare or possibly non-existent in the neighborhood of the farm. In both samples there was overlap between most troublesome and least troublesome (both ranks one to five) lists.

The only animals not appearing on both R. lists, with the exception of the starling, were classed as least troublesome. They were the fox, muskrat, prairie chicken (Sharptailed Grouse), Sandhill Crane, partridges, 'songbirds', weasels, mink, groundhog, and raven.

Overlap was also evident in the most and least troublesome lists (ranks one to five) of the N.R. sample. All animals appearing on only one list were in the least troublesome class. They were the crow, moose, 'songbirds', pheasants, hawks, badger, elk, geese, cougar (probably does not live in study area), owls, fox, wolf, and skunk.

In both samples more respondents liked the large terrestrial predators than disliked them (Fig. 22a and 22b). Only amongst the R. group did more respondents dislike the bear than liked it. No respondents in the N.R. sample mentioned the wolf.

MOST TROUBLESOME ANIMAL-N.R. SAMPLE



1 Duck
2 Pocket Gopher
3 Bear
4 Beaver
5 Coyote

6 Moles
7 Mice
8 Magpie
9 Porcupine
10 No response

Figure 21

LIKE AND DISLIKE OF LARGE TERRESTIAL PREDATORS-R. SAMPLE

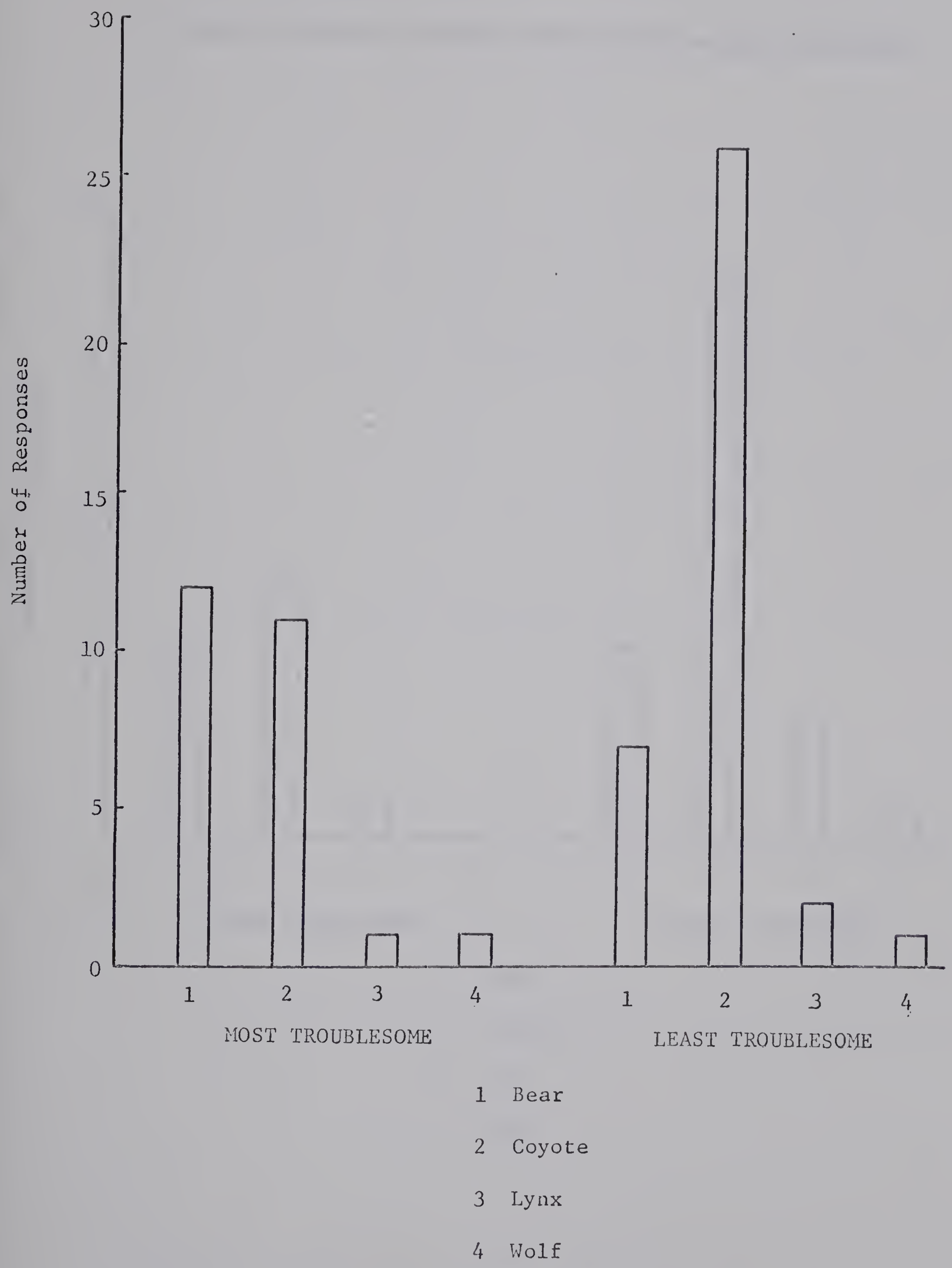


Figure 22 a

LIKE AND DISLIKE OF LARGE TERRESTIAL PREDATORS- N.R. SAMPLE

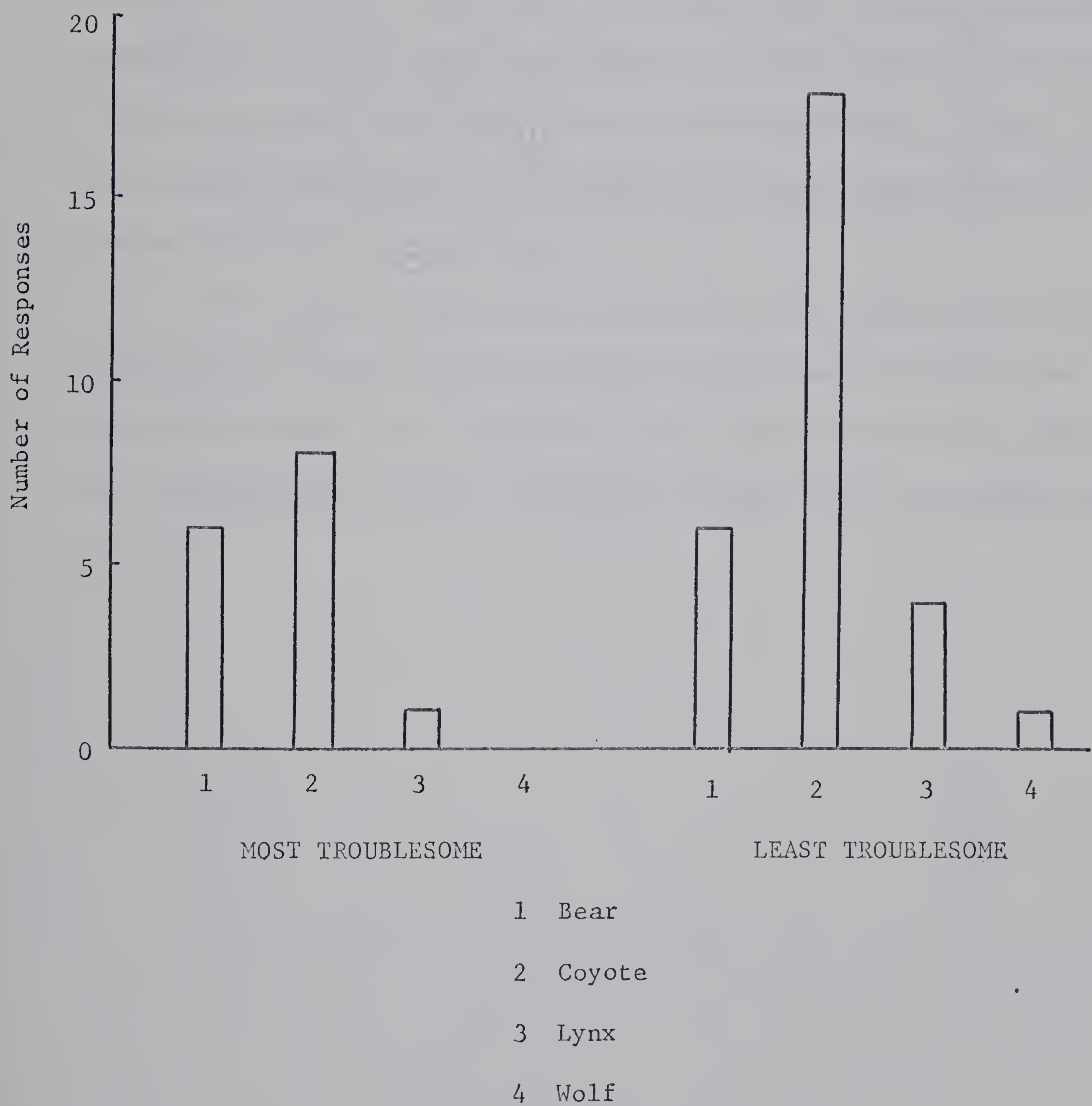


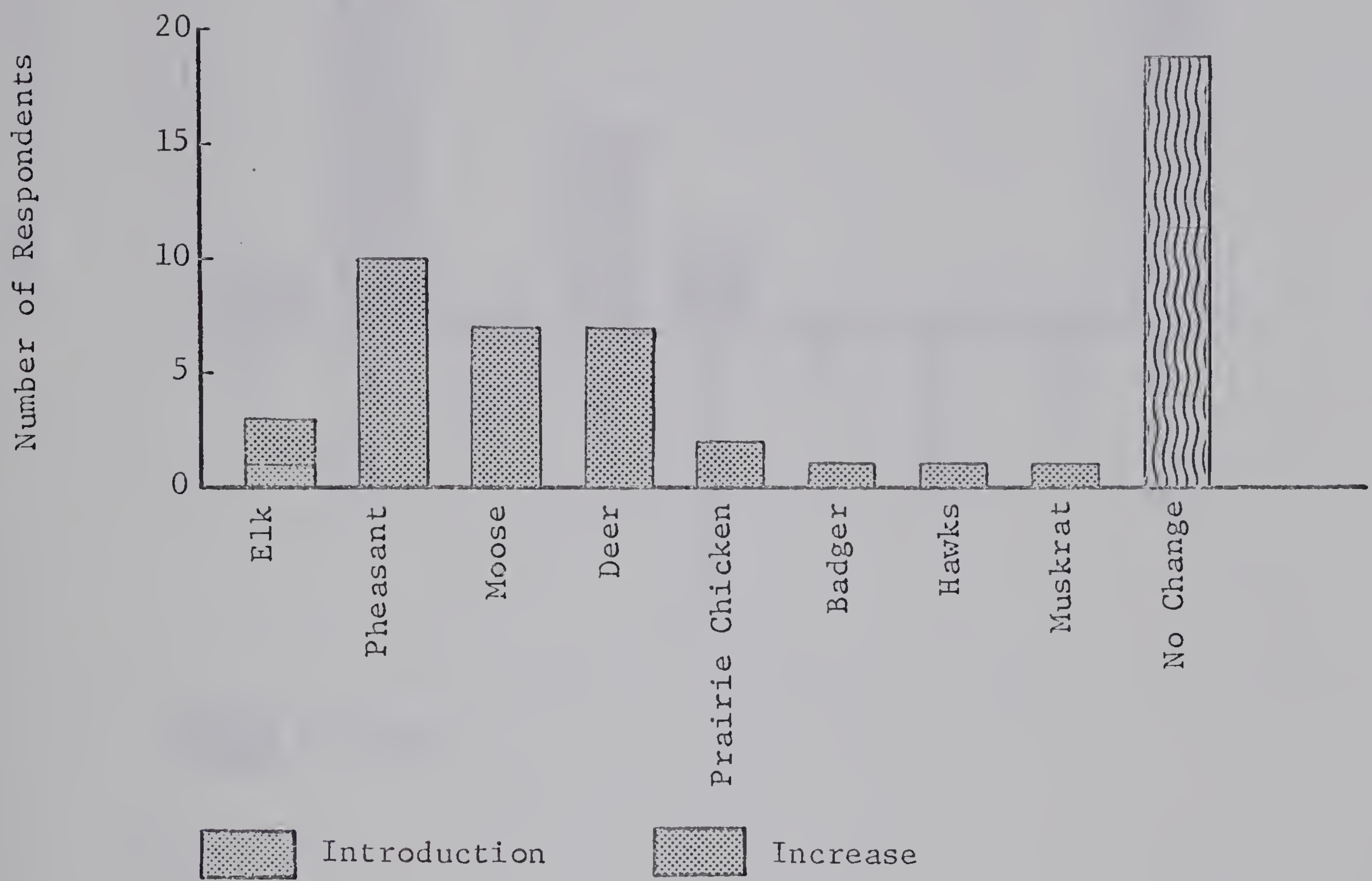
Figure 22b

All respondents were asked if they had any preferences in terms of change of species or change in populations. The responses to this question are shown in Fig. 23a and 23b.

Of the seventeen respondents in the R. group who desired the elimination of certain species, 13 (76.5 per cent), wanted the animal responsible for the reported depredation on their property eliminated. Of the seventeen in this sample that desired reductions, 14 (82.4 per cent) wanted reductions in the populations of the species which had caused the reported depredation.

Only one (16.6 per cent) of the six N.R. respondents desiring elimination of certain species wanted that species eliminated that had caused damage to his property. Four (20 per cent) of the twenty desiring reductions wanted that species reduced which had damaged their property.

PREFERENCES FOR SPECIES AND POPULATION CHANGES -R. SAMPLE



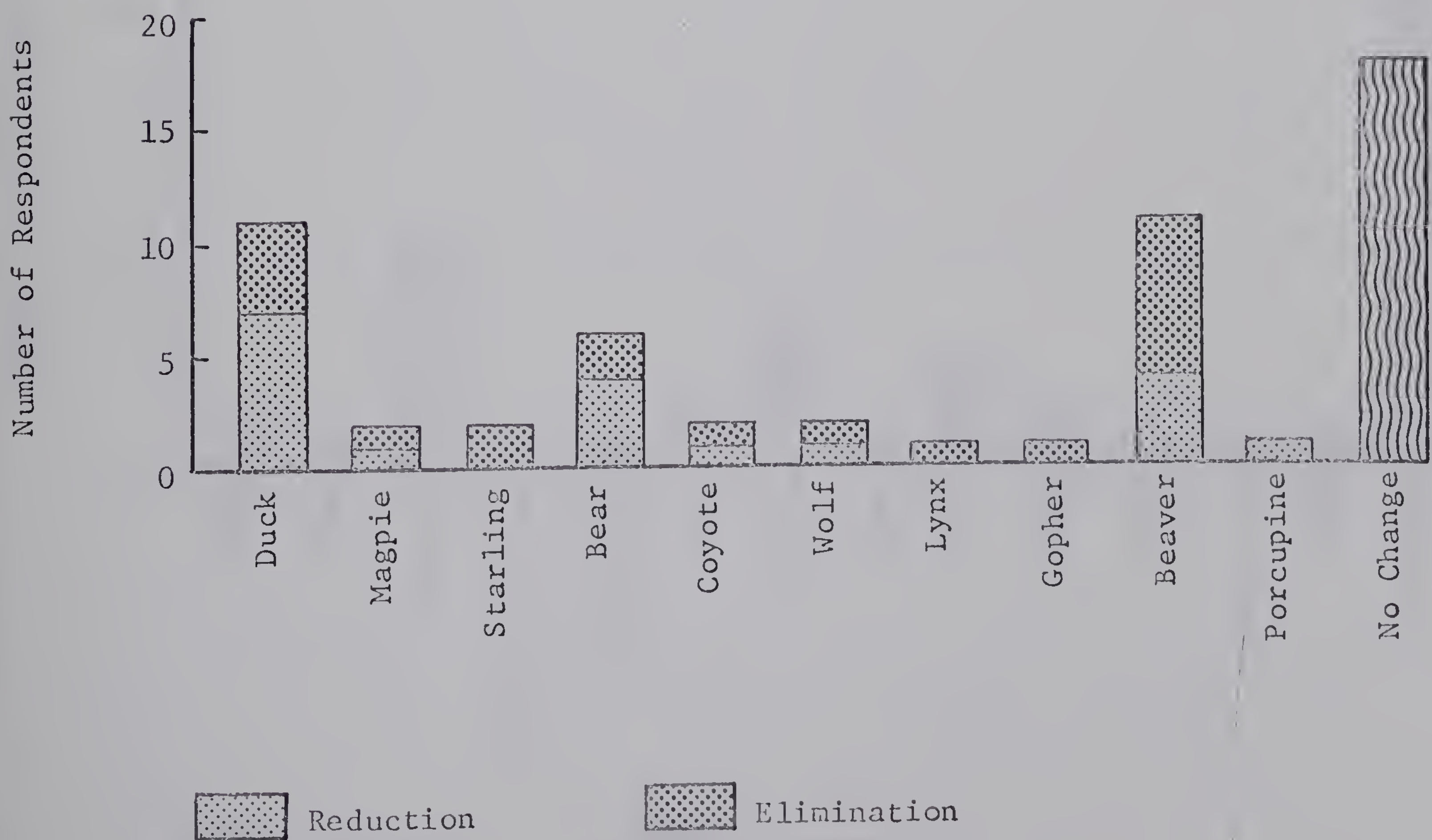
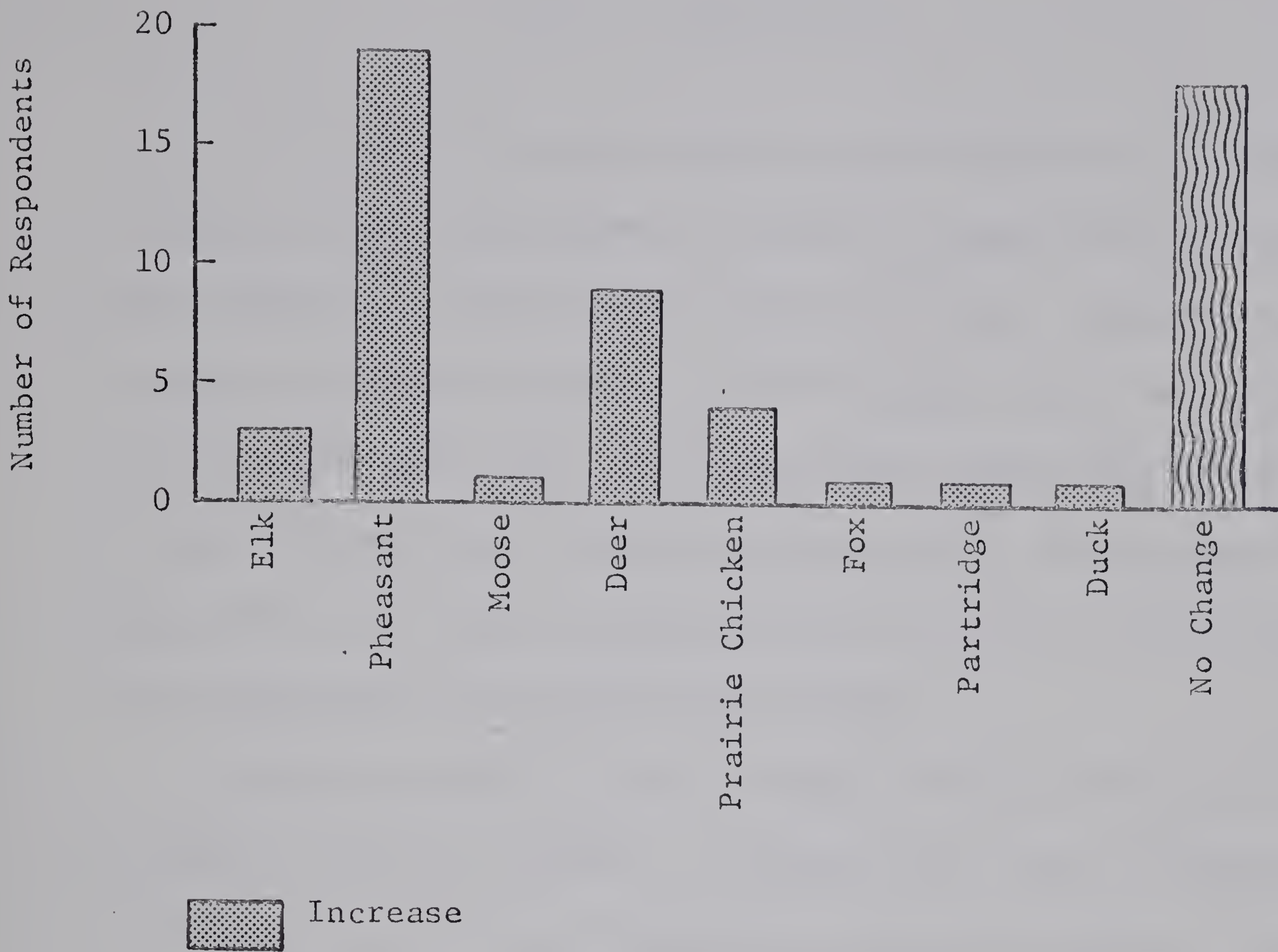


Figure 23a

PREFERENCES FOR SPECIES AND POPULATION CHANGES - N.R. SAMPLE



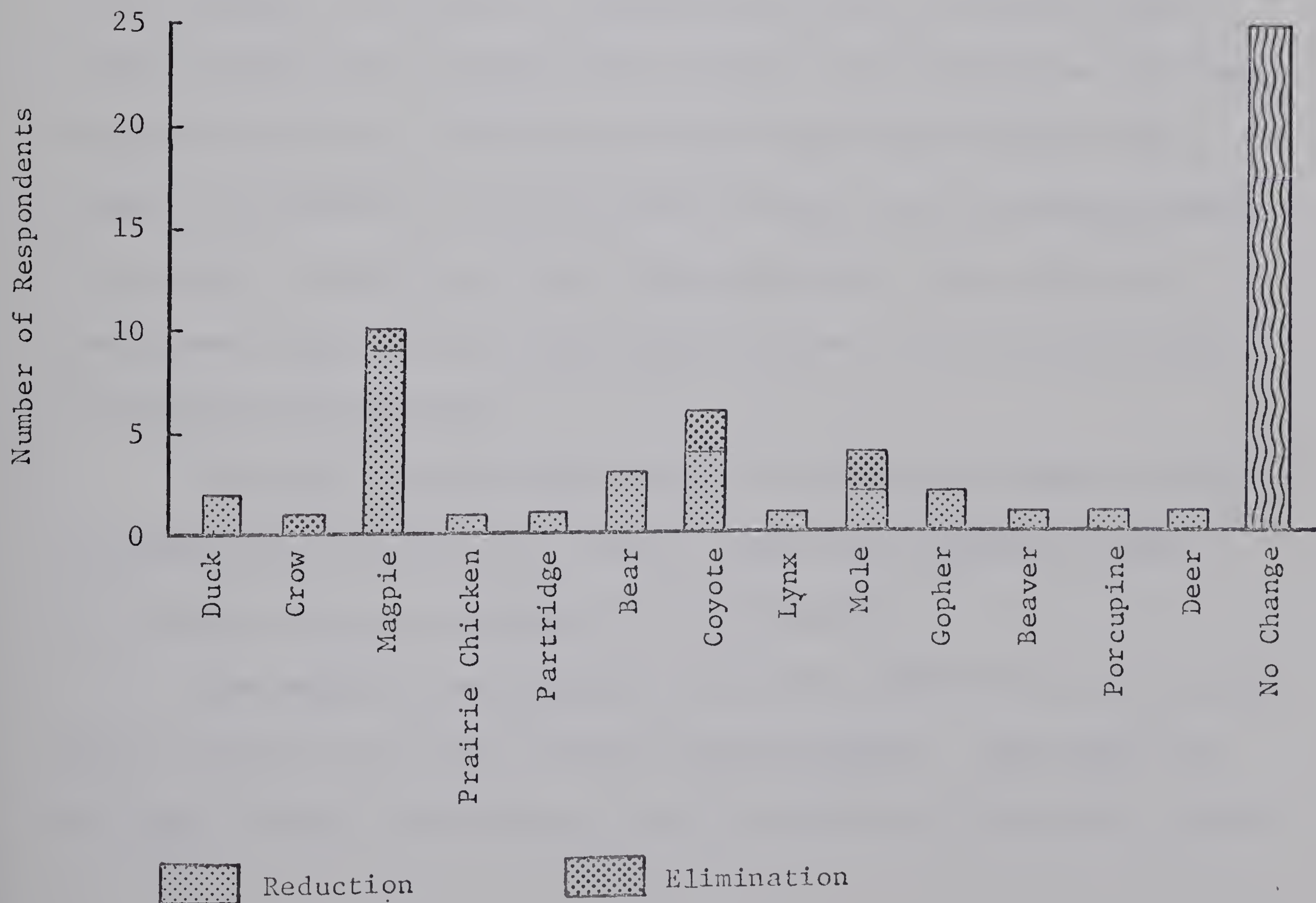


Figure 23 b

CONCLUSION

In order to test the hypothesis that there is a difference in attitudes between those farmers who report damage and those who do not report damage two sample groups were interviewed. One sample group the R. group had suffered reported wildlife damage one or more times during the period 1964-1968. The other sample group, the N.R. group, had not reported any damage during the same period. Both groups were asked about their activities in connection with wildlife, and the details of any depredation which they had suffered.

Costs of damage to the R. sample tended to be higher than damage costs in the N.R. sample. It appears that costs of damage, and not necessarily the fact of damage may determine whether or not a farmer reports damage. Therefore, it may be speculated that should damage costs to some of the non-reporters increase they would become reporters. However, the logical conclusion of this thought would be that every farmer is a potential reporter with a threshold cost determining when he reports. In reality, though there are probably some farmers who would never report, even if depredation became so serious that giving up the farm was necessary.

The causal species and/or type of damage did not seem to affect the decision to report or not report. Both groups had duck, beaver, and predator damage incidents of a similar nature.

Knowledge of the location of the local Alberta Fish and Wildlife office varied significantly between the two samples. Those that did not report damages often did not know the location of the office. Four

possibilities are suggested by this result; these farmers had no damage, they thought they could handle the problem by themselves, they were ignorant of the government's possible role in assisting with wildlife problems or, they received their advice and help through a channel not usually used (e.g. Water Resources Commission) in connection with wildlife problems.

Membership of the Alberta Fish and Game Association was held by a larger proportion of the R. sample. This may reflect the sample group's greater frustration with wildlife problems. The R. sample farmer may feel that by joining the local chapter of the Alberta Fish and Game Association he will be in closer touch with the government from which he is seeking help. It is possible that farmers also felt that they would have greater political power to influence game laws which could affect their livelihood and sporting interests. It is also possible that the Association has been an important vehicle for the communication of information on how to take advantage of insurance and other government services connected with wildlife. Although membership of the Alberta Fish and Game Association varied significantly between the two sample groups, there was no significant difference between the number of sport hunters in each group.

The incidence of subscription to voluntary insurance for protection against some wildlife hazards was slightly greater in the N.R. sample (sixteen vs eleven). The group with less damage, the N.R. group, had more subscribers.

If insurance is taken as a measure of farmer progressiveness the N.R. group's larger share of insurance subscriptions may partially explain why damage has not been reported. If adequate compensation will be paid when damage arises the farmer will be less likely to report damages to the Alberta Fish and Wildlife Office. Since most damage reporting is in fact, application for a damage permit, the N.R. group may also be less inclined to use aggressive and defensive control methods. On a proportional basis the N.R. group did have fewer farmers with damage using these methods.

The relatively low enrollment of both groups in the insurance program may result from poor communication and a lack of publicity. Amongst some farmers there is the belief that damage is an inherent part of farming and, therefore, little initiative is expended to subscribe to the insurance despite knowledge of its existence. The Alberta Wildlife Damage Fund is treated by many farmers in a similar fashion. Farmers know of its existence but do not wish to make claims.

Other factors may also affect the adoption of insurance, such as the effectiveness of the local adjuster or the example of the leading farmers in the area. The proportion of subscribing farmers varies in the study area by locality. The largest concentration of subscribers was found in the southeast section of the study area centering on Thorhild. The role of the Alberta Fish and Game Association chapters in insurance information dissemination was not assessed.

Control methods were used by a large majority of both groups. With few exceptions the methods used were somewhat unimaginative. The use and type of control methods were determined by the causal species

and did not reflect whether or not damage was reported or a particular environmental outlook.

Neither sample group showed strong preferences for any proposed solutions to wildlife problems. The causal species, where a respondent had suffered damage appeared to slightly influence his choice of certain proposed solutions.

Desires for change in animal populations showed common trends in both sample groups. Those who had suffered damage showed preference for the elimination or reduction of the causal species. Both those who did and did not suffer damage desired the introduction or increase of game species in most instances.

Predictably there are many similarities between those who report damage and those who do not, but, there are differences which are probably important. Both reporters and non-reporters faced with similar problems used similar remedies, which were generally simplistic, expedient, and unimaginative. The reporters tended to have a greater awareness of government agencies and other organizations involved with wildlife problems. It must be concluded that these institutions have lagged in promoting changes to more progressive attitudes and practices among farmers. Further study is needed to improve understanding of the role of these wildlife institutions in the formation of farmer's attitudes and conservation education. The role of cultural background in farmer attitude formation and practices involving wildlife also requires further study. Future studies of these aspects should have very intensive coverage of a smaller area, preferably where adequate census

data are available to develop more comparable and representative samples. These constraints make the choice of a political subdivision, as opposed to an administrative one, imperative.

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The format of this Questionnaire has been changed to conform with thesis format requirements.

WILDLIFE DEPREDATION STUDY

Department of Geography
University of Alberta
Edmonton 7, Alberta

STRICTLY CONFIDENTIAL

Dear Sir:

I am a graduate student at the University of Alberta and am at present gathering data for my master's thesis which is concerned with wildlife depredation on farms.

Would you please complete and return this questionnaire as soon as possible. Your time and cooperation is greatly appreciated. The success of this prohect depends upon your assistance. Thank you very much.

____

Michael C. Jansson

I. 1. Location of home and farm buildings. Quarter________

Section _______ Township _______ Range _______

Meridian _______

2. Number of acres farmed? ____________

3. Do you carry any insurance that pays for wildlife damage to crops, livestock, or other property? ____Yes ____No

   If answer is "yes" please answer question 4, if "no" please go on to question 5.

4. What type of insurance do you carry? Alberta All Risk Crop Insurance ________ Other ____(specify) ________

5. Have you ever had any damage to crops, livestock, or other property caused by wildlife? ____Yes ____No

II. 1. Do you hunt? ___No ___Upland birds ___Waterfowl ___Big game ___Small game

2. Do you have a trapline? ___Yes ___No

3. Do you allow the general public to hunt on your land? ___Yes ___No

4. Do you trap or hunt any of the following on your land? ___Gophers ___Magpies ___Skunks ___Coyotes ___Other (specify) ______________________

5. Have you ever obtained a Fish and Wildlife Damage Permit? ___No ___Yes (Explain) ______________________

6. Where is your district wildlife office? ______________________

7. Do you belong to any Fish and Game Assocation? ___No ___Yes (specify) ______________________

III. 1. What control methods, if any, have you used to protect your crops or stock?

______Shooting
______Acetylene explodes (zon guns)
______Leaving machinery in field
______Blasting
______Dogs
______Scarecrows
______Chasing with vehicles
______Poisoning
______Trapping
______Others (specify)
____

2. From the following list, rank from 1 to 5 the most troublesome wildlife, i.e. Number 1 would be the most troublesome animal.

______Bear
______Elk
______Beaver
______Coyote
______Ducks, Geese, Crows
______Deer
______Moose
______Muskrat
______Blackbirds
______Magpies

______Fox
______Lynx
______Gophers
______None are troublesome

______Skunk
______Cougar
______Other (specify) ______________________

3. What 5 animals are least troublesome 1. ________ 2. ________
3. ________ 4. ________ 5. ________

4. What do you think should be done about wild life damage?

_____Increase compensation.
_____Government should establish special feeding areas (Lure crops)
_____No opinion
_____Reduce animal populations
_____Reinstate a bounty system
_____Nothing
_____Other (specify) ______________________________

5. Are there any animals that you would like to see introduced or the population of increased? ____None _____Introduced (specify) ______________________________
_____Increased (specify) ______________________________

6. Are there any animals in your area that are unnecessary and should be drastically reduced or eliminated?

____None _____Reduced (specify) __________

____Eliminated (specify) ______________________________

I. A. This section is to be answered only if answer to number 5 is "yes". If damage has occurred more than once use additional I.A. Forms.

1. In what year did the damage occur? ___1968 ___1967 ___1966 ___1965 ___1964 Other years (specify)______

2. In what quarter section did the damage occur? Quarter______ Section________ Township________ Range________ Meridian________

3. Which month did the damage occur?________________

4. What kind of damage did you suffer?

____Damage to beehives
____Beaver dam building
____Trampled grain (name crop)
____Eating of standing crop (Name crop)
____Eating of swathed, stooked, or piled crop (name crop)
____Poultry (number killed ________ Number injured ______
____Horses: number killed ________ Number injured ______
____Steers; number killed ________ Number injured ______
____Sheep; number killed ________ Number injured ______
____Hogs; number killed ________ Number injured ______
____Household pets (type) ______killed ______ injured ________
____Damage to buildings or equipment (describe)
____Other (describe) ______________________________

5. What kind of animal(s) caused the damage.

____Bear ____Deer ____Elk
____Moose ____Beaver ____Muskrat
____Coyote ____Blackbirds ____Ducks, Geese, Crows
____Magpies ____Fox ____Skunk
____Lynx ____Cougar ____Gophers
____Other (specify) ______________________________

6. How did you identify the cause of damage?
____Tracks
____Claw or teech marks
____Direct observations
____Sounds
____Other (specify) ______________________________

7. What was your estimated loss? ____________

8. How did you compute your loss?
______bushels of ______at $ ________per bushel
______yield per acre of similar but undamaged crop
______Comparison with the previous year's yields
______estimate of market value of killed stock
assessment of value by RCMP or veterinary
______pounds of honey at ______¢ per frame
______hive frames destroyed at $________per frame
______$ ______expenditure incurred in repairing buildings or machinery
______other (specify) ____________________

9. Why do you think the damage occurred?
______nearness to water
______could have happened to anybody
______fencing problems
______crops couldn't be harvested before winter
______severe weather forced animals to seek food on farms
______other (specify) ____________________

10. Did you report your damage to any of the following agencies?
______none
______local Fish and Wildlife Office
______Edmonton Fish and Wildlife Office
______R.C.M.P.
______District Agriculturalist
______Agricultural Fieldmen
______Other (specify) ____________________

If "no" please answer question 10 otherwise go on to No.11.

11. Why did you not report the damages?
Problem not serious enough
______Fish and Wildlife not cooperative
______Problem can't be solved
______Want wildlife to stay in area
______Too much trouble - not worth it
______Other (specify) ____________________

12. Have you ever submitted a claim to the Wildlife Damage Fund?
______Yes ______No ______Did not know it existed

13. Have you ever submitted a claim to the Alberta All Risk Crop Insurance?
_____ Yes _____ No _____ Did not know it existed

14. Have you ever submitted a claim to any other insurance plan.
_____ Yes _____ No
If "yes" give name of plan _______________________________

Mammalian Fauna in the Study Area

Order	Family	Sub-Family	*Genus Species*	Common Name	Occurrence
Insectivora	Soricidae (Shrews)	-	*Sorex cinereus*	Cinereous Shrew	R
		-	*Sorex arcticus*	Saddle-Backed Shrew	R
		-	*Sorex vagrans*	Dusky Shrew	R
		-	*Sorex palustris*	Water Shrew	R
		-	*Microsorex hoyi*	Pygmy Shrew	R
Chiroptera	Vespertilionidae (Bats)	-	*Myotis lucifugus*	Little Brown Bat	R
		-	*Lasionycteris noctivagans*	Silver-Haired Bat	R
		-	*Eptesicus fuscus*	Big Brown Bat	R
		-	*Lasiurus cinereus*	Hoary Bat	R
Lagomorpha	Leporidae (Hares and Rabbits)	-	*Lepus townsendii*	White-Tailed Prairie Hare	O
		-	*Lepus americanus*	Varying Hare	R
Rodentia	Sciuridae (Marmots and Squirrels)	-	*Marmota monax*	Woodchuck	R
		-	*Citellus richardsonii*	Richardson Ground Squirrel, Gopher	R
		-	*Citellis tridecemlineatus*	Striped Ground Squirrel Gopher	R
		-	*Citellus franklinii*	Franklin Ground Squirrel Bush Gopher	R
		-	*Eutamian minimus*	Least Chipmunk	R
		-	*Tamiasciurus hudsonicus*	Red Squirrel	R
		-	*Glaucomys sabrinus*	Flying Squirrel	R

Order	Family	Sub-Family	*Genus Species*	Common Name	Occurrence
Rodentia	Geomyidae (Pocket Gophers)	-	*Thomomys talpoides*	Pocket Gopher, Mole	R
	Castoridae (Beavers)	-	*Castor canadensis*	Beaver	R
	Cricetidae (Native Rats and Mice)	Cricetinae	*Peromyscus maniculatus*	White-Footed Mouse	R
		Microtinae	*Synaptomys borealis*	Lemming Vole	R
			Clethrionomys gapperi	Red-Backed Vole	R
			Phenacomys ungava	Phenacomys Vole	R
			Microtus pennsylvanicus	Meadow Vole	R
			Microtus zanthognathus	Chestnut Cheeked Vole	R
			Ondatra zibethicus	Muskrat	R
	Muridae (Old World (Rats and Mice)	-	*Mus musculus domesticus*	House Mouse	R
	Zapodidae (Jumping Mice)	-	*Zapus hudsonius*	Jumping Mouse	R
			Zapus princeps	Mtn. Jumping Mouse	R
	Erethizontidae (Porcupines)	-	*Erethizon Dorsatum*	Porcupine	R
Carnivora	Canidae (Wolves and Foxes)	-	*Canis latrans*	Coyote	R
			Canis lupus	Wolf	R
			Vulpes fulva	Red Fox	R
	Ursidae (Bear)	-	*Eurctos americanus*	Black Bear	R

Order	Family	Sub-Family	*Genus Species*	Common Name	Occurrences
Carnivora	Mustelidae (Martens, Weasels, Minks, etc.)	-	*Martes americana*	Marten	R
			Martes pennanti	Fisher	R
			Mustela erminea	Short-Tailed Weasel	R
			Mustela rixosa	Least Weasel	R
			Mustela frenata	Long-Tailed Weasel	R
			Mustela vison	Mink	R
	Mustelidae	Guloninae	*Gulo luscus*	Wolverine	R
		Taxidiinae	*Taxidea taxus*	Badger	R
			Mephitis mephitis	Skunk	R
		Lutrinae	*Lutra canadensis*	Otter	R
	Felidae (native cats)	-	*Lynx canadensis*	Lynx	R
Artiodactyla	Cervidae (Deer)		*Cervus canadensis*	Elk	O
			Odocoileus hemionus	Mule Deer	R
			Odocoileus virginianus	White Tailed Deer	R
			Alces alces	Moose	R
			Rangifer caribou	Woodland Caribou	O

Occurrence: R - resident
O - occasional

Selected Avion Fauna of the Study Area

Family	Sub-Family	*Genus Species*	Common Name	Occurrence
Anatidae (Swans, Geese, Ducks)	-	*Olor columbianus*	Whistling Swan	FCM
		Branta canadensis	Canada Goose	FCSR
		Anser albifrons	White-Fronted Goose	FCM
		Chen hyperborea	Snow Goose	CM
		Anas platyrhynchos	Mallard Duck	CSR
		Anas strepera	Gadwall	CSR
		Anus acuta	Pintail	CSR
		Anas carolinensis	Green-Winged Teal	CSR
		Anas discors	Blue-Winged Teal	CSR
		Mareca americana	American Widgeon	CSR
		Spatula clypeata	Shoveler	CSR
		Aythya collaris	Ring-Necked Duck	FCSR
		Aythya valisneria	Canvasback	FCSR
		Aythya affinis	Lesser Scaup	CSR
		Bucephala clangula	Common Goldeneye	FCSR
		Bucephala albeola	Bufflehead	FCSR
		Clangula hyemalis	Oldsquaw	FCM
		Melanitta deglandi	White-Winged Scoter	CSR

Family	Sub-Family	*Genus Species*	Common Name	Occurrence
Anatidae	-	*Oxyura jamaicensis*	Ruddy duck	FCSR
		Mergus merganser	Common Merganser	FCSR
		Mergus serrator	Red-Breasted Merganser	FCSR
Accipitripae	Accipitriinae	*Accipiter gentilis*	Goshawk	FCR
		Accipiter striatus	Sharp-Shinned Hawk	FCSR
	Buteoninae	*Buteo jamaicensis*	Red-tailed Hawk	FCSR
		Buteo swainsoni	Swainson's Hawk	FCSR
		Buteo lagopus	Rough-Legged Hawk	CM
		Haliaeetus leucocephalus	Bald Eagle	SR&SM
	Circinae	*Circus*	Marsh Hawk	CSR
	Falconinae	*Falco columbarius*	Pigeon Hawk	FCSR
		Falso sparverius	Sparrow Hawk	CSR
Tetraonidae (Grouse)	-	*Canachites canadensis*	Spruce Grouse	FCR
		Bonasa umbellus	Ruffed-Grouse	CR
		Pedioecetes phasianellus	Sharp-Tailed Grouse	CR
Phasianidae (Pheasants, Partridges)	-	*Phasianus colchicus*	Ring-Necked Pheasant	CR
		Perdix perdix	Hungarian Partridge	CR

Family	Sub-Family	*Genus Species*	Common Name	Occurrence
Gruidae (Crames)	-	*Grus americana*	Whooping Crane	RM&RSR
		Grus canadensis	Sandhill Crane	M&SR
Phalaropidae (Phalaropes)	-	*Steganopus tricolor*	Wilson's Phalarope	FCSR
		Lobipes lobatus	Northern Phalarope	CM
Laridae (Gulls, terns)	-	*Larus californicus*	California Gull	CSR
		Larus delawarenis	Ring-Billed Gull	CSR
		Larus pipixcan	Franklin's Gull	CSR
		Larus philadelphia	Bonaparte's Gull	FCSR
		Sterna hirundo	Common Tern	FCSR
		Chlidonias niger	Black Tern	CSR
Columbidae (Pigeons, doves)	-	*Columbia livia*	Domestic Pigeon	CR
		Zenaidura macroura	Mourning Dove	FCSR
Strigidae	-	*Bubo virginianus*	Great Horned Owl	CR
		Asio otus	Long-Eared Owl	FCSR
		Asio flammeus	Short-Eared Owl	CSR
		Aegolius acadicus	Saw-Whet Owl	FCR
Caprimulgidae		*Chordeiles minor*	Common Nighthawk	FCSR

Family	Sub-Family	Genus Species	Common Name	Occurrence
Corvidae (Crows, magpies, jays)	-	*Perisoreau canadensis*	Gray (Canada) Jay	CR
		Cyanocitta cristata	Blue Jay	FCR
		Pica pica	Black-Billed Magpie	CR
		Corvus corax	Common Raven	FCR
		Corvus Brachyrhynchos	Common Crow	CSR
Sturnidae (Starlings)	-	*Sturnus vulgaris*	Starling	CSR
Icteridae (Larks, blackbirds, orioles)	-	*Xanthocephalus xanthocephalus*	Yellow-headed Blackbird	FCSR
		Agelaius phoeniceus	Redwinged Blackbird	CSR
		Euphagus carolinus	Rusty Blackbird	FCSR
		Euphagus cyanocephalus	Brewer's Blackbird	FCSR
		Quiscalus quiscula	Common Grackle	FCSR

Occurrence: C - Common, FC - Fairly common,
S - Summer, R - Resident
M - Migrant

N.B. This list is not exhaustive. Only those birds classed as common and fairly common have been included. Many species in the families included on the list have never been implicated in depredation problems and therefore have not been mentioned.

APPENDIX C

THE FISH & WILDLIFE DIVISION

GAME DAMAGE PERMIT

№ 10226 K

TO KILL OR REMOVE ANIMALS OR BIRDS DAMAGING FARM CROPS OR OTHER PROPERTY

Under and by virtue of the authority vested in the Honourable the Minister of Lands and Forests under The Game Act.

Mr. ______________________ of ______________________

is hereby authorized to kill or remove ______________________

on lands described as: ______________________

____

____

between the ________ day of ______________, 19___ and the ________ day of ______________, 19___

This permit given in order to prevent damage caused by ______________________

____

Reverse side of this Permit must be completed and returned to the Fish & Wildlife Division Office at

______________________, Alberta,
within ten days from date of expiry.

____
For Director of Fish & Wildlife

FORM NO. 149

I hereby certify that I did kill or remove ______________________

______________________ under this permit.

____
Signature of Permittee.

Date ______________________

APPENDIX D

GOVERNMENT OF THE PROVINCE OF ALBERTA

Alberta Regulation 292/68

The Game Act
The Wildlife Damage Fund Regulations

(O.C.1696/68)

(Filed September 11, 1968)

The Lieutenant Governor in Council, upon the recommendation of the Honourable the Minister of Lands and Forests, pursuant to clause (w) of subsection (1) of section 126 of The Game Act is pleased to establish The Wildlife Damage Fund Regulations as follows:

1. These Regulations may be cited as "The Wildlife Damage Fund Regulations".

2. (1) In these regulations

a. "adjuster" means an adjuster appointed pursuant to The Alberta Hail Insurance Act;

b. "Board" means The Alberta Hail Insurance Board;

c. "crops" means wheat, oats, barley, flax, rye, field peas, buckwheat, rape, grasses, clover, alfalfa, field corn grown for seed or fodder, either standing, in swaths, in sheaves on the ground or in stooks in the field, but does not include crop in stacks, crop or grazing lands, wild crop, or crop already threshed and stored in granaries or in bins;

d. "damage claim form" means the form supplied by the Board for the purpose of obtaining particulars of the damage caused by wildlife to crops;

e. "fund" means the Wildlife Damage Fund;

f. "livestock" means the Minister of Lands and Forests;

g. "Minister" means the Minister of Lands and Forests;

h. "wildlife" means those animals and birds defined as "big game" and "game birds" by The Game Act.

(2) Terms defined by The Game Act and used in these regulations shall have the meaning given to them by that Act.

3. (1) Any person whose crop is damaged by wildlife may claim compen-

sation for the damage out of the fund by submitting to the agent of The Board nearest his place of residence a completed and signed damage claim form accompanied by an appraisal fee of $25.00 for each quarter section of land or portion thereof on which the damaged crop is situated.

(2) An appraisal fee shall be paid by the claimant to the agent for every appraisal or reappraisal of his claim conducted by an adjuster at his request.

(3) The damage claim form shall be signed by the claimant or his agent and shall show

a. The name and address of the claimant,

b. particulars of the crop in respect of which compensation is claimed, including

   i. the kind of crop,
   ii. the number of acres of each kind of crop, and
   iii. the legal description of the parcel or parcels of land upon which the crop is grown,

c. the name of the person to whom the compensation is to be paid where damage is established, and if there is more than one person, the share to be paid to each, and

d. any other particulars the Board may require.

4. (1) All claims for compensation must be properly filed with the Board or any of its agents before the 1st day of December of the relevant crop year.

(2) A claimant for compensation may not subject the damaged crop to any harvesting operation without the consent of an adjuster until after the adjuster has appraised the damage in question.

5. The Board shall as soon as possible consider every damage claim received and accept or reject the claim for compensation, as the Board in its absolute discretion decides.

6. (1) The Board shall provide to the claimant or his agent a copy of every report received from an adjuster concerning the claim.

(2) The decision of the Board concerning the payment of any claim for compensation out of the fund and the amount thereof is final and conclusive.

7. (1) The amount of compensation that may be awarded in respect of any damage claim for a total loss or destruction or any crop shall not exceed $15.00 per acre or an amount equal to one-half of the commercial value of the crop destroyed on each acre of land, whichever is the lesser sum.

(2) Where a crop is damaged but not totally destroyed, the amount of

compensation payable to any claimant or claimants shall be determined by multiplying the sum that would be payable for a total loss in accordance with subsection (1) by the percentage of damage the adjuster finds in existence on the land described in the damage claim form.

(3) The Minister shall establish the commercial value of the crop for the purpose of determining the amount of compensation payble pursuant to subsections (1) and (2).

General

8. (1) The Board shall, on the last day of each month in every year, prepare and submit to the Minister a statement of all the claims for compensation and the adjusting costs incurred during the preceding month.

(2) Upon receipt of the statement referred to in subsection (1), the Minister shall make payment out of the fund to the Board the total amount of claims and adjusting costs shown in the statement.

Livestock Losses

9. (1) A person whose livestock is shot by another person on land situated in a wildlife management unit during the hunting season for bird game or big game in that wildlife management unit may, within three days following his discovery of the dead or injured livestock,

a. report the death of or injury to the livestock to the nearest Detachment of the Royal Canadian Mounted Police, and

b. complete an application, on forms supplied by the Minister, for payment of compensation from the fund for the dead or injured livestock.

(2) The application referred to in clause (b) shall be forwarded to the Director of Fish and Wildlife at Edmonton and shall be accompanied by

a. a statutory declaration completed by the claimant showing

i. the full name, address and occupation of the claimant,
ii. the date, place and legal description of the land where the dead or injured livestock was discovered,
iii. the value of the dead or injured livestock at the time it was killed or injured and its salvage value, if any,
iv. the amount of compensation claimed,
v. the name and address of the person who killed or injured the livestock, if known to the claimant,
vi. the steps taken, if any, to recover compensation from the person who killed or injured the livestock, or if no such steps have been taken, the reasons for not taking them, and
vii. that the amount of compensation claimed is fair and reasonable,

b. certificates signed by two local ratepayers setting out their evaluation of the dead or injured livestock for which compensation is claimed.

(3) A report of the investigation conducted by the Royal Canadian Mounted Police Detachment to which the death of or injury to the livestock was reported, shall be made available through the Attorney General's Department to the Minister.

10. (1) The Minister shall consider every claim for compensation for dead or injured livestock and shall advise the claimant whether the claim is accepted or rejected.

(2) In all matters concerning a claim for compensation for dead or injured livestock the decision of the Minister is final and conclusive.

11. (1) The amount of compensation that may be paid to any claimant in respect of any dead or injured livestock shall not exceed eighty per cent of the average current market price of the species killed or injured, as determined by the Minister.

(2) In determining the amount of compensation, the Minister may consider with the current market prices any other factors which, in the Minister's opinion, may affect the value of the dead or injured livestock.

(3) In no case shall the amount of compensation paid exceed the following maximums:

a. For a head of cattle	\$500.00
b. for a goat	\$ 50.00
c. for a horse	\$400.00
d. for a sheep	\$ 75.00
e. for a swine	\$ 75.00

12. (1) The Royal Canadian Mounted Police may engage the services of a qualified veterinarian to examine the dead or injured animal.

(2) When an inspection is made by a veterinarian pursuant to subsection (1), the Minister may authorize a reasonable remuneration for veterinary services from the fund not exceeding \$25.00 for veterinary inspection and 10¢ a mile for transportation.

Rescission

13. The Wildlife Damage Fund Regulations established under Order in Council No. 1446/66 and filed as Alberta Regulation 268/66 are hereby rescinded.

(Extract from The Alberta Gazette, Sept.30, 1968)

APPENDIX E

NON-REPORTING SAMPLE MOST TROUBLESOME ANIMALS
(Ranks 1-5)

Most Troublesome Animal

Animal	Number Responses
Ducks	17
Pocket Gophers	10
Bear	4
Beaver	4
Coyote	3
Moles	3
Mice	2
Magpies	1
Porcupines	1
No response	5
Total	50

Second Most Troublesome Animal

Animal	Number Responses
Ducks	5
Magpies	5
Pocket Gophers	4
Coyote	3
Bears	2
Deer	2
Blackbirds	2
Beaver	1
Prairie Chickens	1
Squirrels	1
Rabbits	1
Cranes	1
Partridges	1
Moles	1
No response	20
Total	50

Third Most Troublesome Animal

Animal	Number Responses
Coyote	2
Squirrels	2
Gophers	1
Magpies	1
Porcupines	1
Moles	1
No Response	42
Total	50

Fourth Most Troublesome Animal

Lynx	1
Deer	1
Starlings	1
No Response	47
Total	50

Fifth Most Troublesome Animal

Ducks	1
No Response	49
Total	50

NON-REPORTING SAMPLE LEAST TROUBLESOME ANIMALS
(Ranks 1-5)

Least Troublesome Animal

Animal	Number Responses
Deer	16
Coyote	7
Prairie Chicken	5
Magpies	4
Crows	3
Partridge	3
Bear	2
Moose	2
Songbirds	2
Lynx	1
Ducks	1
Pocket Gophers	1
Grouse	1
No Response	2
Total	50

Second Least Troublesome Animal

Animal	Number Responses
Deer	11
Prairie Chicken	6
Coyote	4
Magpies	4
Partridge	3
Ducks	2
Moose	2
Pheasants	2
Rabbits	2
Grouse	2
Bear	1
Beaver	1
Crows	1
Lynx	1
Blackbirds	1
Squirrels	1
Hawks	1
Badger	1
No Response	4
Total	50

Third Least Troublesome Animal

Animal	Number Responses
Partridge	7
Coyote	6
Songbirds	5
Prairie Chicken	4
Geese	3
Crows	3
Pocket Gophers	2
Elk	1
Ducks	1
Lynx	1
Deer	1
Magpie	1
Couger	1
Pheasant	1
Hawk	1
Porcupine	1
Owl	1
Grouse	1
No Response	9
Total	50

Fourth Least Troublesome Animal

Animal	Number Responses
Deer	7
Moose	4
Rabbits	4
Partridge	4
Bear	3
Pheasants	3
Crows	2
Songbirds	2
Lynx	1
Magpies	1
Prairie Chicken	1
Squirrels	1
Porcupine	1
No Response	16
Total	50

Fifth Least Troublesome Animal

Animal	Number Responses
Hawks	3
Ducks	2
Fox	2
Prairie Chicken	2
Squirrel	2
Porcupine	2
Coyote	1
Geese	1
Lynx	1
Magpie	1
Skunk	1
Partridge	1
Owls	1
Songbirds	1
Badger	1
Wolf	1
No Response	27
Total	50

REPORTING SAMPLE MOST TROUBLESOME ANIMALS
(Ranks 1--5)

Most Troublesome Animal

Animal	Number Responses
Ducks	30
Beaver	11
Bear	8
Squirrel	1
Total	50

Second Most Troublesome Animal

Animal	Number Responses
Pocket Gophers	10
Coyote	6
Magpies	4
Bear	3
Ducks	3
Beaver	2
Crows	2
Deer	2
Blackbirds	2
Squirrels	2
Moles	2
Elk	1
Lynx	1
Rabbits	1
Porcupine	1
No Response	8
Total	50

Third Most Troublesome Animal

Animal	Number Responses
Magpies	7
Pocket Gopher	6
Blackbirds	4
Coyote	3
Moose	2
Starlings	2
Beaver	1
Ducks	1
Crows	1
Porcupines	1
Wolf	1
No Response	21
Total	50

Fourth Most Troublesome Animal

Animal	Number Responses
Deer	3
Ducks	2
Pocket Gophers	2
Blackbirds	2
Magpies	2
Starlings	2
Bear	1
Skunk	1
Rabbits	1
Hawks	1
Badger	1
No Response	32
Total	50

Fifth Most Troublesome Animal

Animal	Number Responses
Coyotes	2
Squirrels	2
Deer	1
Blackbirds	1
Starlings	1
Porcupines	1
Owls	1
No Response	41
Total	50

REPORTING SAMPLE LEAST TROUBLESOME ANIMALS
(Ranks 1-5)

Least Troublesome Animals

Animal	Number Responses
Deer	15
Coyote	9
Moose	5
Squirrels	3
Weasel	3
Bear	2
Crows	2
Prairie Chicken	2
Partridge	2
Beaver	1
Skunk	1
Rabbit	1
Hawk	1
Songbirds	1
Moles	1
Badgers	1
Total	50

Second Least Troublesome Animal

Animal	Number Responses
Deer	10
Coyote	6
Moose	6
Partridge	4
Rabbits	3
Porcupines	3
Bear	2
Fox	2
Muskrat	2
Prairie Chicken	2
Geese	1
Pocket Gophers	1
Magpie	1
Squirrels	1
Hawk	1
Songbirds	1
Wolf	1
Weasel	1
No Response	2
Total	50

Third Least Troublesome Animal

Animal	Number Responses
Deer	4
Prairie Chicken	4
Rabbits	4
Coyote	3
Magpie	3
Songbirds	3
Bear	2
Gophers	2
Moose	2
Hawk	2
Partridge	2
Woodchuck	2
Elk	1
Duck	1
Geese	1
Lynx	1
Skunk	1
Squirrel	1
Porcupine	1
Mice	1
Badger	1
Mink	1
Raven	1
No Response	6
Total	50

Fourth Least Troublesome Animal

Animal	Number Responses
Coyote	5
Prairie Chicken	4
Geese	3
Moose	3
Rabbit	3
Songbirds	3
Deer	2
Hawk	2
Owls	2
Bear	1
Elk	1
Blackbird	1
Magpie	1
Squirrel	1
Crows	1
Badgers	1
No Response	14
Total	50

Fifth Least Troublesome Animal

Animal	Number Responses
Coyote	3
Partridge	3
Rabbits	2
Cranes	2
Hawks	2
Porcupine	2
Geese	1
Crows	1
Fox	1
Deer	1
Moose	1
Muskrat	1
Blackbirds	1
Skunk	1
Prairie Chicken	1
Grouse	1
Songbirds	1
Badgers	1
Weasel	1
Woodchuck	1
No Response	22
Total	50